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Rocks and Minerals

Official Journal of the Rocks and Minerals Association

A Magazine for Mineralogists, Geologists and Collectors

January, 1948

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Vol. 23, No. 1 *Whole No. 198*

19th LIST OF FINE MINERALS

FLUORITE, Annaberg, Saxony. Small yellow xls. on rock. 2 x 2¼ ..... $ 2.00
ANDRADITE, Vaskö, Hungary. Yellowish green xls. on rock. 3 x 2 x 1½ 3.00
SCHEELITE, Zinnwald. Small xls. w. Zinnwaldite on Quartz. 3 x 2 .... 4.00
SCORODITE, Saxony. Minute xls. on rock. 2 x 1½ 2.00
PROCHLORITE v. CORUNDOPHILITE, Chester, Mass. Xld. 2½ x 1¼ .. 1.50
ESSONITE, Ala, Piedmont. Brilliant xls. w. Diopside on rock. 2½ x 2 x 2 5.00
CHALCOPYRITE, Ecton, Staffordshire. Xld. on Calcite. 3 x 2 ..... 2.00
APATITE, Greenwood, Me. Good lilac xls. w. Cookeite in rock.
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AXINITE, Tasmania. Xlline. mass with some xls. 3 x 2 x 1¼ 2.00
PLANCHEITE, S.W. Africa. Blue mass w. veins of Dioptase. 3 x 2 x 1½ 5.00
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GREEN CALCITE, French Creek, Pa. Enclosing Byssolite. 3 x 3 x 2 .... 1.50
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CALCITE, Bisbee. An old-time stalactite of delicate green color.
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MICROCLINE v. AMAZONITE, Colo. Group of pale green xls.
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BARRANDITE, Nevada. Vein in rock. 3 x 2½ 2.00
EUDIALYTE v. EUCOLITE, Norway. Masses in rock. 3 x 2 ..... 1.50
PHENACITE, Mt. Antero, Colo. Good small xls. on Feldspar.
3½ x 2½ 3.00
STILBITE, Iceland. White 1" "wheatsheaves" on rock. 3 x 2 ..... 3.00
BERYL, Paris, Me. Good term, green and yellow xl. 3 x 2¼ x 1¾ 3.50
HEMATITE, Egremont, Cumberland. Brilliant xls. on mass. 4 x 2 ..... 3.00
OPAL v. HYALITE, Bohemia. Glassy masses on rock. 2 x 1½ 1.50
ANGLESITE, Chihuahua, Mexico. Xld. masses in Sulphur. 2½ x 2½ x 2 2.00
ROEBLINGITE, Franklin, N. J. Chalky masses w. Willemite, etc. 3 x 2 x 2 5.00
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with xls. of Chalcopyrite. A very old specimen. 3 x 3½ x 2 .... 6.00
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CHALCOPYRITE, Bare Hills, Md. Mass w. iridescent tarnish. 3 x 2 x 2 2.00
STIBNITE, Pribram, Bohemia. Xlline. mass w. blue tarnish. 5 x 2 x 1 .. 2.50
SIDERITE, Cornwall. Minute brown xls. on two sides of rock. 3 x 3 .... 2.00
BRAUNITE, Miguel Burnier, Brazil. Small xls. in mass. 2 x 2 ..... 3.00
ERYTHRITE, Schneeberg, Saxony. Xld. radiating in rock. 2 x 2 x 1½ .. 3.00
COBALTITE, Tunaberg. Brilliant ½" xl. in Chalcopyrite. 1¾ x 1½ 3.00
NAGYAGITE, Nagyag. Xlline. plates in rock. 2 x 1½ 8.00
Another with Rhodochrosite. 2 x 1 x 1¼ 5.00
HEMATITE, Elba. Xld. w. brilliant iridescent tarnish. 1½ x 1¼ 1.50
CALCITE, Egremont, Cumberland. Good twinned xl. 2 x 1¼ x 1½ 2.50
CINNABAR, San Benito Co., Calif. Massive w. some Serpentine. 2½ x 2 2.00
TOPAZ, Schneckenstein. Good ¾" xls. on rock (not gem) 3 x 2 ..... 5.00
RHODONITE v. FOWLERITE, Franklin, N. J. 1" pink xls. in ore. 3 x 2 x 2 2.50
GOLD, Offenbanya. Xlline. plates on xld. Stibnite (!). 1½ x 1 ..... 8.00
VAUQUELINITE, Beresovsk, Urals. W. some Crocoite on rock.
2 x 1½ x 1½ 10.00

HUGH A. FORD

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PETER ZODAC

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1948

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The official Journal of the Rocks and Minerals Association

CHIPS FROM THE QUARRY

NORTHWEST FEDERATION CONVENTION

Bozeman, Montana. September 4th-5th, 1948

The Bozeman Rock Club of Bozeman, Montana, has been selected as the host club for the Northwest Federation of Mineralogical Societies to conduct the 1948 convention and mineral exhibition September 4th-5th, 1948.

The Bozeman Club plans to follow the general organization outline used by the Seattle Mineral Club for the very successful 1947 convention and exposition. Kenneth L. Sullivan of Bozeman, who has the local agate and gem shop, is Chairman of the general committee, and many of the special committees have already been appointed and are at work. The exhibition will be shown at the Bozeman Armory main hall, where accommodations for 120 standard electrically lighted, glass covered display cases have been provided, and the Northwest Federation and its constitutent clubs and members now own about a 120 of these cases which should be available.

There are many attractions in the locality of Bozeman which should be an added allurement to visitors for the convention. Within easy travel by automobile are the Lewis and Clark Cavern, the copper mining center of Butte, Montana, and the famous smelters at Anaconda, the Yellowstone National Park famed for its geysers and for its Grand Canyon of the Yellowstone, interesting deposits of petrified wood, mining of many types, corundum, soapstone and asbestos mines. Also within easy driving distance are many points of historic interest, the headwaters of the Missouri River, Virginia City, early Montana capital famous for its placer mining and Vigilantes, Last Chance Gulch at Helena, Montana, now capital of the state and built largely upon the washed over "pay dirt" of the Sixties'.

Those interested in providing commercial exhibits or in attending the exhibition should write H. E. Murdock, Secretary, Bozeman, Montana, for further information. Mr. Murdock is also vice-president of the Northwest Federation.

W. F. Brewer,
Pub. Chairman

Be Sure You're Right—Then Write!

On several occasions we have received very uncomplimentary letters regarding subscriptions. The following is a sample: Editor R. & M.:

I just received notice that my subscription expires with this month's issue. What kind of an organization is yours anyway? Can't you keep your records straight or do you think you can get away with it—giving me only a six months subscription whereas I paid for 12—a full year. Tell your dumb bookkeeper that I have my canceled check for $3.00 and its date is June 21, 1947. How then does my subscription expire with the December, 1947, issue? You have pulled a blunder this time. What are you going to do about it?"

On checking the above subscription we found that it was received in June but its accompanying letter stated—"Begin the subscription with the JANUARY, 1947, issue."

Some collectors forget easily. But in the above case there was no excuse because when the subscription was received, a R&MA membership card was sent the subscriber within a few days and this membership card gave the month and year when the subscription would expire. If there was an error in the subscription, why did not the collector complain immediately?

Wanted—An Article on Delaware Minerals!

Rocks and Minerals would appreciate an article or some notes on the old Dixon quarry and its minerals and Way's quarry and its minerals. An article on the vivianite occurrences of the state would also be gratefully received.

ROCKS and MINERALS

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PLUNGE POOLS, POTHOLES, AND RELATED FEATURES

BY RONALD L. IVES

Vice-President, Rocks and Minerals Association

ABSTRACT

Origin and development of plunge pools, potholes, and related features are briefly outlined, with field examples; and their significance to the field geologist and mineralogist is sketched.

INTRODUCTION

Waterfalls and related features have been mentioned in the literature of various nations almost since the invention of writing. Since about 1500 A.D., it has become increasingly apparent that these features are not permanent features of our landscape, but change, slowly but certainly, from century to century. One of the best known, and most carefully studied, changes of this sort is "Hennepin's Falls", now known as Niagara, which is slowly migrating upstream, and will some day, in the near future (geologically speaking), cut a channel into Lake Erie.

Within the last sixty years, geologists and geographers have devoted much attention to the mechanics of change, instead of being merely recorders of natural features. Most unfortunately, the pioneer students of Geomorphology published their findings in works normally read only by advanced students and specialists, so that much useful knowledge, while not lost, is inaccessible to the average "man who wants to know".

In this brief description, some of the more important data concerning waterfalls and their related features will be outlined, and references furnished to more extensive expositions.

PLUNGE POOLS

Wherever the bed gradient of a stream decreases, there is a *localized* increase in the abrading power of the flowing water, so that, after a time lapse determined by the rate of stream flow and local conditions, the stream bed will be deepened in the zone of gradient decrease. The most common example of this is the plunge pool at the foot of a waterfall (Fig. 1.)

Below an ordinary waterfall, the downward force of the falling water pounds the rock, tending to break it up. This action is quite complex, consisting not only of direct impact, but of rupturing action due to pressure of water in fissures and joints. Swirling outflowing water from beneath the falls carries away the smaller fragments of disrupted rock, and keeps many of the larger fragments in constant motion, increasing their rate of disintegration. In many instances, "fines" from plunge pool erosion are deposited at the downstream end of the plunge pool.

Because plunge pool abrasion and erosion tend to undermine the "riser" of the falls, upstream migration of many waterfalls is largerly determined by plunge pool conditions. Niagara Falls is a good example of this.

Even in arid regions, where it rains only once a year or only a few times in a generation, plunge pools are found. The sand-laden waters of ephemeral desert streams are potent abrading agents, and the deep plunge pools below falls that exist for only a few days a year are often important sources of water in areas where water is scarce. Tinajas Altas, just north of the Arizona—Sonora border, in longitude 114° 05' W (approximately), consists of a series of twelve such pools(1).

POTHOLES

In most bedrock areas where stream beds change gradient markedly in a small distance, cascades and rapids are to be

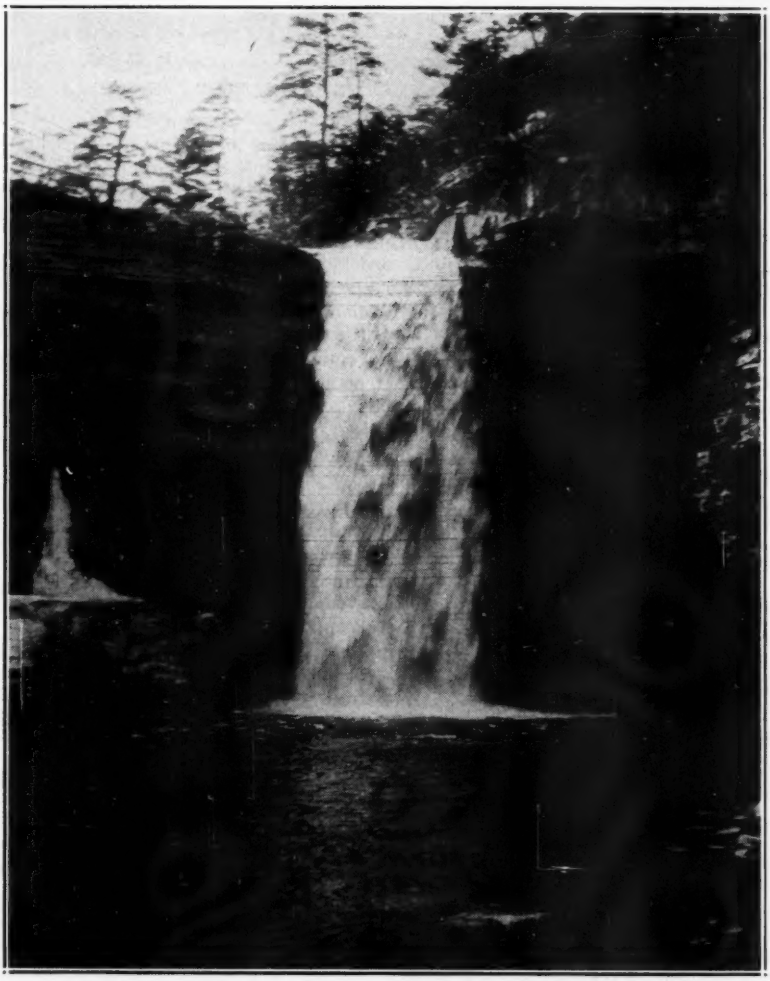

Fig. 1 Minnewaska Falls, Smiley Estate, Shawangunk Mountains, Ulster Co. N. Y., a typical medium-sized waterfall in sedimentary rock, with a well developed plunge pool. Photographed from the downstream margin of the plunge pool in May, 1924.

found. Many such stream beds contain pothholes, produced by the combined action of swirling water and loose rocks.

A typical group of potholes, in a granite area, is shown in Fig. 2. This group, which is still "active", occurs near the foot of a small waterfall.

Potholes of this general type, in all stages of development, can be found in all mountain areas in the United States, in most of the glacially-rejuvenated areas of the northeast, and in parts of the south where stratigraphic conditions produce interruptions in drainage gradients.

A pothole which has been undercut by the stream, and from which the sidewall has been eroded, is shown in Fig. 3. Comparison of the polish in the interior

of this feature with that on the adjacent side of the stream channel indicates that destruction of the pothole was quite recent, both geologically and historically.

Enormous potholes, undeniably the work of falling water aided by gyrating rocks, are found in many areas in the northeastern United States where there are now no adjacent waterfalls or stream channels. These are attributed to cascades that fell onto the rock through holes in the glacial ice that formerly covered the region. Some of these are called "glacier mills". Similar potholes, some apparently in process of formation, have been noted in the Swiss Alps. Several potholes probably formed under glacial ice can be seen in Bronx Park, New York City.

In all of the above potholes, a major part of the drilling is done by one or more "grinders", which are loose rocks, continually rolled or dragged around in the hole. One such grinder is shown in Fig. 4. This, almost a perfect sphere, with the largest diameter 2-15/16" and smallest diameter 2-13/16", is composed of hard granite. Although the amount of abrasion done by a spherical grinder in one circuit of the pothole floor is quite small, the net effect of a year's circulation, at the rate of one circuit per minute, which is relatively slow, is over 500,000 circuits, which is sufficient to do considerable wearing of even the hardest rocks.

Shapes of potholes, while individually variable, fall into three general classes. The most common (Fig. 5, A) is correctly described by Gilbert as that of the interior of a test tube. Not as common is the "cored" shape (Fig. 5, B) in which a central core, usually of small dimensions, remains in the bottom. Very common is the swelled profile, in which the bottom of the pothole is somewhat larger than the top opening (Fig. 5, C).

Fig. 2 A group of potholes in Paradise Park, Colorado, a small tributary to Grand Lake (Grand County). Near the top of the view are remnants of potholes excavated when the stream bed was higher than at present. A pothole with one side eroded away is in the upper left. There are several "working" potholes under the water.

In no case was the grinder found to be larger than the top opening, nor is such a condition probable.

In some rapidly-flowing streams, the characteristic roar of the water is in part due to the grinding of the stones in the potholes. Quite frequently, the existence of potholes under a stream can be detected by this sound.

Although pothole grinders are today merely interesting geological specimens, in former times they were used as cannonballs; and many spherical stone hammer heads found in ancient Indian camps owe all or part of their shape to natural working. Except in purely ceremonial matters, the American Indian was a thoroughly practical human, who made extensive use of the natural materials available to him.

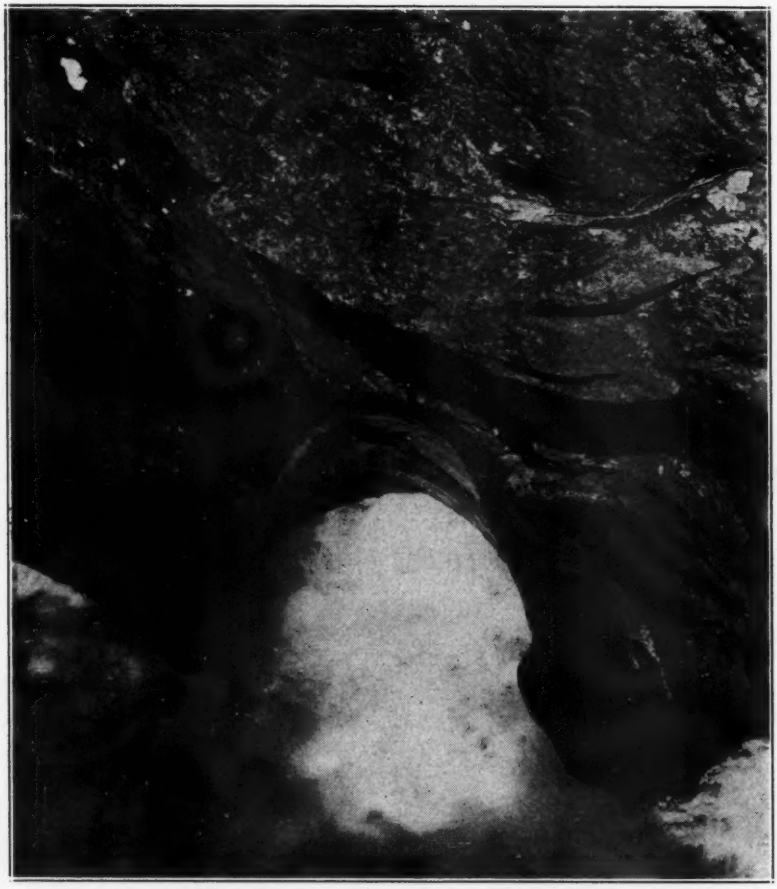

Fig. 3 Remains of a pothole which has been undercut by the stream which formed it and from which one side has been eroded. Note the interior polish. This is one of a group of potholes in Lake Creek, Colorado, just west of Monitor Gulch (Leadville Quadrangle).

Fig. 4 Spherical pothole grinder from Paradise Park, Colorado.

RELATED FEATURES

Similar in shape and appearance to the potholes already described, although usually lacking the nearly-perfect symmetry and the fine internal polish, are a large group of pits and depressions in hard rock, not in any way related to present or past streams. These are grouped under the name "potholes due to weathering". Sizes range from less than an inch in diameter to many yards. Depths, although also variable, are usually less than diameters. This is in sharp contrast to the proportions in stream potholes, where the depth is usually much greater than the diameter.

A fairly typical cross-section of a pothole due to weathering is shown in Fig. 5, D. Although a few depressions of this type are due largely to wind erosion, as at Topaz Mountain, Utah, most of these features are caused by a combination of chemical and frost action. A small pothole due to weathering is shown in Fig. 6. This depression, located on the south wall of the Silver Lake Valley, Colorado, above Goose Lake (Rocky Mountain National Park Quadrangle), has been excavated since the rock surface was glacially polished during the later Pleistocene. The initial depression, which was later enlarged by frost action and chemical

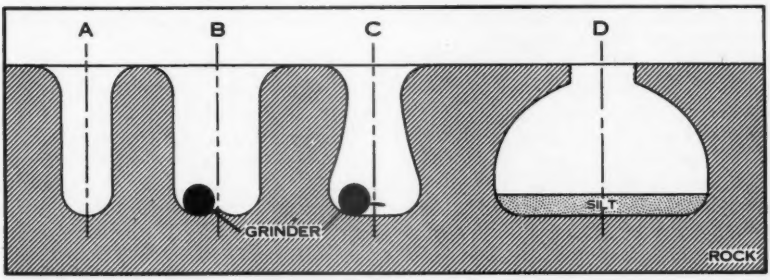

Fig. 5 Characteristic pothole sections. All figures shown here in section are symmetrical about the vertical axis. A—test tube shape. B—"cored" shape. C—swelled shape. D—section of a pothole due to weathering. Axial symmetry is often imperfect here.

Fig. 6 Pothole due to weathering. This small pit is located in a surface that was polished by ice during the later Pleistocene.

solution, may have been created by lichen spalling.

A pair of very large potholes, probably due to weathering of soft granite, although there have been many arguments pro and con, is located on a high ridge southwest of Baldpate Inn, Rocky Mountain National Park. (see Lily Mountain, Rocky Mountain National Park Quadrangle). These, locally called "The Devil's Bathtubs", are shown in Fig. 7. The diminutive figure on the rim is Dr. L. O. Quam, of George Washington University, who is of normal dimensions.

In general, potholes due to weathering are either very shallow, or have a small hole in the bottom, through which the products of rock disintegration can escape. The "Devil's Bathtubs" have several small leaks near the bottom.

Very similar structures, due entirely to solution, are found in many humid limestone regions. These, in general, are conical in cross-section, and have no well-

defined bottom. All gradations from cavities due largely to wind action, through those due to a mixture of factors, to those entirely caused by solution, can be found in the field.

SIGNIFICANCE OF POTHOLES

Abraded potholes, such as those normally found in stream beds, are indications of active stream flow. Where such potholes are not related to present streams, they suggest that the adjacent region was once glaciated.

Ancient potholes, in some areas, become filled with heavy concentrates, so that they are carefuly hunted by some placer miners. Some potholes in the California Mother-Lode country have yielded considerable amounts of flour and lump gold. In other western areas, where ancient stream deposits have been buried

Fig. 7 "The Devil's Bathtubs", located near the top of Lily Mountain, near Baldpate Inn, Estes Park, Colorado.

by lava flows, the "fossil" potholes have been found to contain natural concentrates of heavy minerals, sometimes of great value.

Large potholes due to weathering sometimes serve as traps for small and medium-sized animals, who fall in while trying to get to the water, and either drown or starve to death. A few of these "animal traps" in the Great Plains area have produced valuable deposits of the bones of recently-extinct mammals.

Students of physiographic history find that abandoned potholes, either high on the walls of present valleys, or far from modern streams, furnish valuable evidence concerning the former courses of regional drainage.

Unlike most geologic phenomena, the migration of plunge pools, and the deepening of potholes, are rapid enough so that one man, in a normal lifetime, can record and observe the changes. Many plunge pools migrate upstream at rates measurable in feet per year, and some potholes deepen several inches a year.

(1) First described by Eusebio Kino, famous Jesuit explorer, in 1698. Location accurately shown on the American Geographical Society's map *Baja California—Norte,* provisional edition, New York, 1928. Travel in this area is hazardous—make local inquiry before leaving main highways.

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MINERALOGICAL TRIP TO GEM LOCATIONS OF DEVON AND CORNWALL, ENGLAND, PLANNED FOR AUGUST 1948

Readers of *Rocks and Minerals* may recall the article on Gems in Cornwall and Devon, England, by T. Orchard Lisle in the January, 1944, issue. A trip limited to 50 rockhounds and geologists to these locations has been planned for August, 1948, in connection with the International Geological Congress to be held in London. A motor bus will leave London on Saturday morning, August 14, and will return on Tuesday, August 24. Among the locations to be visited are the Meldrum quarry, near Tavistock, Devon, where green topaz and green tourmaline is found; abandoned copper mines near Tavistock, also to come lode and alluvial wolfram workings. Then china clay works and operating tin mines in Cornwall will be visited, as well as St. Michael's Mount where blue topaz crystals are obtainable. The Lizard serpentine district will be examined, and the mineral exhibits at the Truro and Penzance museums will be inspected. The serpentine from the Lizard come in black with green veins and black with red veins. Mr. Lisle remembers that his father had a fireplace made from a combination of these two Lizard serpentines. The rock was polished, and was very handsome.

The trip is under the direction of Sir Arthur Russell, but applications should be made to G.F. Claringbull, secretary, care of the 18th Session of the International Geological Congress, Geological Survey and Mineral Museum, Exhibition Road, South Kensington, London, SW7, England.

Altogether 32 geological trips are being made in various parts of the British Isles during the Congress, including to the hematite ore districts, and to the lead-zinc of Halkyn. Many magnificent collectors specimens come from the mines of England.

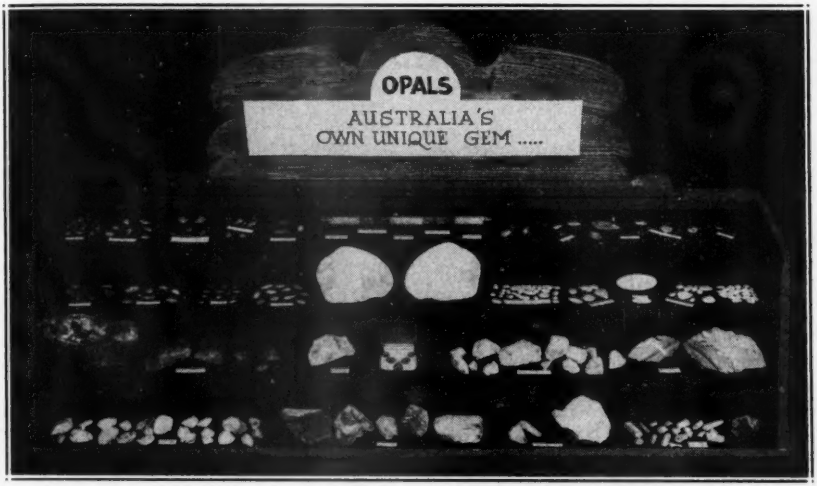


EXHIBIT OF FINE AUSTRALIAN OPAL

Some of the finest opal mined in Australia today is now on exhibit in the Australian Display Centre, RCA Building Concourse, Rockefeller Center, New York City. The Display Centre is conducted by the Australian Government Trade Commissioner, Suite 426, 630 Fifth Avenue, New York City.

The entire history of the opal industry in Australia is represented by a comprehensive collection from the rough material to the finished gem.

The exhibits comprise excellent specimens of Queensland Boulder opal; the famous Lightning Ridge black opal, now rare; Andamooka light "crystal" opal; and the colourful pin-fire light opal from Coober Pedy, South Australia, where recently a rich pocket was found.

The Andamooka light opal on display is the finest quality on world markets. It is shown both in the rough and finished state. The material is extremely "clean" and possesses an unusual brilliance.

With the rarity of black opal, Australian craftsmen have developed the innovation of opal doublets to a high degree of perfection. It has not been possible previously to manufacture a cabachoned opal doublet, but Australian techniques have evolved a method whereby a particularly colourful transparent type of Andamooka opal is now produced with a cabachoned surface. This is unusual to the U.S. market. A striking example of opal doublets is "Crowning Glory", shown in the display. The set comprises two pendant stones and an oval ring stone to match. The magnificence of its colour and pattern is seldom found and this set is considered the finest of its type in the world.

The opal exhibit is outstanding for the high quality of the gems. Each stone has a character all its own and retains nature's scintillating blending of the vivid rainbow colours of the spectrum. A unique feature of the display is a gold-tipped ruler made from every type of opal found in Australia.

Added interest is given to the exhibition of this romantic Australian gem by the showing of comparatively rare opalised sea shells, and wood and bone fossils. They are the result of millions of years of transition from their original calcium and organic origin—scientists yet have no conclusive proof as to how opal is formed.

The opal exhibit is shown by courtesy of Mr. E. Gregory Sherman, Sydney, Australia, world renowned authority on opals, who recently arrived in the United States.

WATER-BORED "POT-HOLES" UNCOVERED IN BED OF DROUTH-PARCHED SUSQUEHANNA

Reprinted from Daily Intelligencer Journal, Lancaster, Pa., Friday, October 24, 1947

What is possibly one of America's most extensive displays of a singular geologic phenomena—the deeply-bored and sculptured basalt rocks of a river bed—was uncovered almost in its entirety this week for the first time in the memory of man when the drouth-parched Susquehanna River retreated far beyond its normal "low" stage and exposed a fantastic wonderland of Nature's tremendous and never-ending handiwork.

Near Falmouth, Lancaster county, Penn., about one-quarter of a mile south of the confluence of Conewago Creek with the river a jumbled "badlands" of massive basalt rocks stretches nearly from shore to shore—most of it bone-dry, and the thin channels of water no more than 18 inches in depth at any place. Oldest residents of the river communities agree that the Susquehanna presently is as low, or lower, than they have ever seen it.

At the famous "Falls of Conewago", which extend diagonally southwestward from a point just below Falmouth to York Haven, York county — a distance of two to three miles — it is now possible to walk across the river bed from Lancaster county to York county, with very little wading.

The dramatic effect of the drouth conditions on the river stage, however, displays a far more dramatic spectacle to anyone venturing into the middle of the Susquehanna's normal watercourse.

Out there, in the center of this jumbled expanse of smoothly-polished, variously-colored rock, the record of millions of years of whirling natural forces presents a truly awe-inspiring exhibit.

Over an area of approximately three-quarters of a square mile, thousands of the water-caused geologic phenomena known to scientists as "pot holes" have been exposed to view—most of them, according to local authorities, for the first known time.

The "pot hole" is a curious and fascinating example of Nature's irresistible forces and perfection of workmanship. Starting as a literal "scratch" on the surface of a great rock, the minute indentation sooner or later collects a few grains of sand. These, whirled and eddied by the endless current, begin the job that will take millions of years. Through the ages, they grind away at the edges of the depression, enlarging it until pebbles and later smaller boulders tumble in and continue the process.

The result, after a few million years, is a "pot hole"—a cylindrical or elliptical bore into the rock, ranging from two inches or less in diameter to more than six feet, and attaining depths of eight to ten feet.

Majority of the "pot holes" are perfectly circular and straight-sided bores. Others, through the action of counter current forces, are elliptical or even trough-shaped. Most of them still contain, at the bottom, the "tools", or the stones that presently continue the endless grinding.

While "pot holes" have been discovered at many other places in Pennsylvania —notably in the Wilkes-Barre region — and while some may be seen farther down the Susquehanna, bored into comparatively soft chlorite schist, the "Falls of Conewago" exhibit is unique both in its great extent and in the fact that these holes are worked into volcanic basalt— the hardest rocks to be found in Lancaster county.

To Dr. Samuel S. Simons, of Marietta, goes the credit of "discovery" of this vast geologic "rockshop". Although many of the smaller holes have been visible, from time to time at low water stages, and have been seen by fishermen and naturalists, including Dr. Simons, this week's great drouth condition enabled him to explore the entire area for the first time.

Amazed at what he found, Dr. Simons invited Dr. Herbert Beck, professor emeritus of chemistry and mineralogy at Franklin and Marshall Collge, to visit the river bed with him. With Mrs. Simons and Mrs. Beck, the two men went over the area and agreed that the dis-

This vista of jumbled rocks, the normal bed of the Susequehanna River between York and Lancaster Counties, Pennsylvania, this week brought to light a major geological phenomenon, as extended drouth conditions drained away more river water than the oldest river-dwellers could remember. At the left of the picture, Dr. Herbert Beck, professor emeritus of chemistry at Franklin and Marshall College, Lancaster, Penn., examines one of the thousands of "pot holes" in the river bed, revealed for the first time in the memory of man. With him is a Lancaster newsman. The two men are standing in the approximate middle of the river. The spot is about one-quarter of a mile south of the Lancaster-Dauphin County line, near Falmouth. This view, looking north, shows the seldom-seen extent of the "Falls of Conewago", so-called from the confluence of the Conewago Creek with the Susquehanna, just above Falmouth, Lancaster County. At no point in this vast stretch of water-carved and polished rocks is the water, presently, more than 18 inches in depth. It is possible, with very little wading, to cross from Lancaster County to York County on foot. (Intell Photo.)

IT TOOK AT LEAST 20,000,000 YEARS TO MAKE THIS PICTURE—Standing in one of the many huge "pot holes" in the bed of the Susquehanna River, near Falmouth, Lancaster County, Pa., a Lancaster newsman contemplates the results of millions of years of patient, unending labor by the forces of Nature. Uncovered when the river retreated far beyond normal "low" stage, due to the extended drouth, thousands of these "pot holes" are providing a fascinating field day for professional and amateur geologists. Come high water again, and they will disappear for another 25, 50, 100 years—perhaps forever. Just above the tremendous hole occupied by the newsman may be seen the beginnings of another hole, the concentric scorings of whirling stone "tools" plainly visible in the hard basalt surface. At the extreme left and at the right bottom, two other examples of the phenomenon may be observed. In other places, the water action through hundreds of thousands of centuries has carved the rock into fantastic, smoothly-polished figures. (Intell Photo.)

covery was of more than passing interest.

Dr. Simons said that he has been observing the "pot holes" in the river bed for the past 30 years, but "had no idea" that there were so many of them. He expressed the opinion that there are "more than twice as many" now exposed than ever have been seen before.

RIVER LOWEST SINCE 1901

"I have seen 'pot holes' at many places in the United States", he added, "but nowhere is there a more extensive exhibit or a more interesting one". To questions about the present river stage, Dr. Simons said that a veteran riverman told him that it was the lowest "since 1901". There was a low stage of the river in 1936. Dr. Simons added, when quite a few of the larger holes were exposed, but "nothing like at present".

Dr. Beck said that, to his knowledge, none of the State geologists were aware of this great stretch of "pot hole" formations. At Harrisburg, Dr. Donald A. Cadzow, presently executive secretary of the Pennsylvania Historical and Museum Commission, and formerly in charge of the extensive archeological work carried on in the Lower Susquehanna Valley, said the "Conewago Falls" pot holes were

THE WORK OF TIME AND THE RIVER—An unexpected chapter in a story that began millions of years ago is examined here by Dr. Herbert Beck, professor emeritus at Franklin and Marshall College, who points to evidence of Nature's titanic and tireless handiwork—here shown in the drouth-uncovered bed of the Susquehanna River, near Falmouth, Lancaster County, Penn. Dr. Beck is directing attention to the fairly-well-advanced progress of one of the thousands of "pot holes" unexpectedly uncovered when the river retreated far below normal "low" stage and exposed the huge basalt boulders of its normal bed. These "pot holes", cylindrical or elliptical borings into the rock—many of them several feet in diameter and many feet deep—began as shown here. In the hole may be seen the "tools" of Nature, the small rocks and pebbles which, swirled and eddied by hundreds of thousands of years of current, accomplished the boring process. (Intell Photo.)

"news" to him, and said that he would inform the State geologists of their existence. "I think they'll be most interested", he commented.

EXAMINE PHENOMENA

Meanwhile, a group of Lancaster newspapermen accompanied Dr. Beck on a return trip to the "pot hole" area and spent several hours examining various examples of the phenomena.

Editor's Note: *Rocks and Minerals* is deeply grateful to Mr. Earl E. Keyser, of the Daily Intelligencer Journal, for permission to reprint the above very interesting article and for the three photos which acompany it. Our thanks are also extended to Mr. L. J. Duersmith, Franklin and Marshall College, Lancaster, Penn., who first called the article to our attention.

WHAT PRICE RUTILE?

BY J. C. BOYLE

Said Chaucer—

'Whan that Aprille, with hise shoures soote
The droghte of March hath perced to the roote

.....

Thanne longen folk to goon on pilgrimages'

And he thereby accurately described the circumstances under which six of us, members of the Philadelphia Mineralogical Society, set forth on the bright Sunday morning of April 26, 1925, to try our luck in locating some of the 'money stones' that many years before had made the area around Parkesburg, Penn., a famous collecting ground.

The 'money stones' were finely crystallized specimens of rutile — these the farmers of this area gathered as they plowed their fields in the Spring and sold —hence the name by which they were locally known. At the turn of the century and before, titanium was a nuisance to steel metallurgists, but when ground fine, rutile was used to give various light yellow shades to artificial teeth. The manufacture of these was an industry of some importance in Philadelphia.

Arrived at Parkesburg, we set forth and for several hours tramped over ploughed fields, stumbled over last season's corn stalks, and walked along roads carefully inspecting cuts and fills for signs of 'money stones'. We approached a number of the natives of the area, but all professed ignorance of any producing locality; one old lady at a Colonial farmhouse, who knew them as 'rootil', could add nothing to aid our search.

Completely defeated, we took to the railroad and made our way back to Pomeroy to meet the homeward train. Passing through a cut whose sides consisted of a green mud resulting from disintegration of the chlorite schist in which the rutile was found, I was following some of the others of the party and as I walked was sharply watching the bank for signs. Suddenly I spied a pair of twin crystals at my feet. One of the fellows ahead had left a deep footprint in the mud and in so doing had revealed the specimen at the side of the depression. It consisted of two geniculated twins, of three ounces weight and forming roughly a rhomb-shaped mass, completely crystallized, of a brilliant lustre and fine red color.

When we reached Pomeroy, a quick reckoning while awaiting the train showed we had spent about $3.50 apiece for the day's outing—and so we named the find 'The $21.00 Rutile'. To top it all off I proudly displayed the specimen while four others gathered round in worshipful attitudes and the sixth of the party photographed the comedy.

Such luck is seldom mine—in fact, on far more occasions my feelings could be more accurately described as those of the bride in the opening couplet of Mendelssohn's Wedding March (Revised version)—

'Here comes the bride
FIT TO BE TIED'.

MUSHROOM CALCITE

BY CHARLES A. THOMAS
706 Church Street, Royersford, Pennsylvania

One of the reasons why the mineral collectors who live reasonably near a good active zeolite producing quarry are so fairly persistent and regular with visits to such a locality is that, like fishing in the ocean, one never knows what the catch will be.

We go into the quarries cautiously (?), look around for fresh blasts, appraise the rockfall with a discerning and calculating eye, and alight from our vehicle with some misgivings—more misgivings if rock busters are a-crawling like ants all over the place, ever searching for that which is new or better than that which the last blast produced.

On that bright Sunday afternoon in June, 1945, the writer made a casual visit to what may well be called Pennsylvania's best zeolite quarry. Its name, with some hesitation for various reasons, the writer reluctantly admits is Kibblehouse Quarry, Montgomery County, near Perkiomenville, Pennsylvania. Readers, please, the writer does not live at this quarry, is not an authority on its contents, is even undecided and not a little hazy on the geological strata in evidence there, and what is more, he is continually amazed at the always increasing number of odd and interestingly unique shapes and forms of calcite crystals.

Now at last we have some meat—calcite, and a unique (I like the word for unusual mineral specimens) calcite the reader must admit as you will find shortly. On this hot June day the writer found. . . .

. . . . Reader, please stop the writer (with a letter) if you have heard this one. Visuallize first the trunk or stem of a white mushroom, then instead of the smooth brown umbrella shaped top of the edible fungi, you see a perfectly faceted gem of calcite, faceted almost exactly like the blue-white diamond in your lady's engagement ring, but much shallower and more flat and in keeping with the shape of some mushrooms or toadstools, and in perfect proportion with its stem.

Was there but one freak mushroom calcite? No, there were hundreds of such crystals found in a cavity in calcium and hard clay. There were loose ones and insecurely attached ones and those which were more firmly attached to the matrix are now in the writer's permanent display cabinet.

These crystals on stems of white calcite are at their largest no higher than perhaps five-thirty-seconds of an inch. At their smallest, they are fit subjects for microscopy. Some stems and heads are white to colorless, but most of the heads are a mottled brown and tan while all of the stems are cream white to white and quite opaque. The stems are sturdy little cylindrical posts with the faceted head set squarely or slightly tilted. There were no two headed sets nor were any of the stems doubled or twinned. There were in the same boulder, cavities with hundreds of the same form and sizes of the calcite crystal, but with very short or no stems at all. All of the clayey, limey boulder was a half tough, half fragile mass with much earthy material somewhat yellow which was easily removed with water.

The Mineralight, set with a fresh filter at about the time the mushroom calcites were found, caused a dull red fluorescence in the faceted crystals only. There was some light phosphorescence noted which emanated from the massive or earthy matrix.

The writer has sought in vain for information on similar occurrences of calcite. Under the microscope, stalactitic growths have been noted connecting spheres of chlorite or cubes of pyrite. Limonite stalactitic or capillary threads have been mounted for micro study where these threads connect barite, malachite, zircon, and other interesting crystals. These, however, do not compare in mystery with the definately cylindrical post with the translucent faceted calcite crystal perched so noneccentrically on top like the natural fungus mushroom.

PETRIFIED FOREST DISCOVERED IN KAOKOVELD*

20 ACRES OF TRUNKS 100 FEET LONG.
PROPOSAL THAT AREA SHOULD BE PRESERVED AS MONUMENT.

NEW FINDS ANNOUNCED AT TAUNGS

A Petrified Forest 200 million years old has been discovered in the Kaokoveld of South-West Africa. The discovery was made when Mr. J. H. Oberholzer, a farmer near Franzfontein, called the attention of an American scientific expedition to fragments of petrified wood.

Professor Charles L. Camp, the leader of the expedition (from the University of California) said today that the fossilised logs lie embedded in conglomerate gravels which extend from a volcanic mountain. They cover an area of more than 20 acres.

Some of the trunks are more than 100 feet long and 5½ feet in diameter at the base. More than 50 trunks have been counted in the 20-acre area and there are many more scattered over adjacent ground.

Dr. Camp says the specimens are remarkable in that details of the original structure—the annual rings, woody cells and fibres, knots and even the borings of ancient insects are clearly discernible.

The wood has been replaced by agate and other siliceous material and, in some instances, the trunks are filled with limestone. Colours range from yellow-brown and grey to red and black.

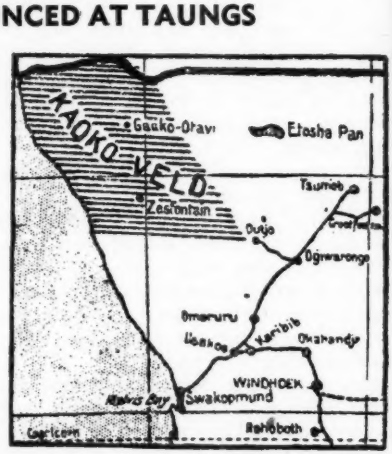
The stone forest was the home of ancient tribes who used the agatised wood for implements and weapons, many of which are strewn around the vicinity.

Today the remote region near Franzfontein is roamed by rhinos, springbok, gemsbok and other game.

SETTLERS ARRIVING

Lions chase zebras over the flats and jackals raise their young in the crannies of the hills. But white men are now entering this wild area for the first time, driven from drought regions, and are grazing their karakuls there, digging their wells and building mud brick houses.

Dr. Camp fears that there is danger that in the near future settlers and tourists may remove much of the petrified wood from the age-old forest, and has suggested that steps should be taken to guard it.



The Kaokoveld area, shaded, is about 300 miles northwest of Windhoek.

He reports that pioneer settlers and officials interested in protecting their newfound wonder of nature and that the Secretary for External Affairs, Mr. D. Forsyth, is equally enthusiastic and believes that a national monument, protected by the settlers, might ward off the anticipated dangers.

After Mr. J. H. Oberholzer's find, Dr. Camp and Mr. J. W. Brandt, a geologist of a South-West African company, discovered other petrified logs embedded in a sandstone containing coal veins about 50 miles north of Brandberg.

TAUNGS AREA

Since his arrival in the Union Dr. Camp has visited various places of palaeontological interest, and at Norlim, near Taungs, he and his colleague, Dr. Frank Peabody, have made discoveries which support their contention that the limestone deposits there are the richest fossil-bearing areas yet discovered in South Africa. They have decided to work in three distinct paleontological levels, two of which have never before been found in this region.

The discovery of the two new ages of cave-fill deposits may be of prime importance in connection with current work on the ancestry of man, since one antedates the limestone in which Australopethicus was discovered and the other is yielding a rich supply of fossils of a definitely later period.

The new locations—six in all—are close to the site of the near human skull identified by Prof. Raymond L. Dart, of the University of the Witwatersrand, some 20 years ago.

While Dr. Camp is not yet prepared to announce the extent of the finds in detail, he disclosed that he and Dr. Peabody have unearthed fossils in all three levels. The oldest rock, which may reveal for the first time a picture of life that preceded the period in which the Dart specimen lived, has yielded fossil remains of a large, thick-skulled antelope or small buffalo.

The antelope fossils include teeth, leg bones and an excellent skull specimen.

GREAT AGE

The ancient deposits were located at the base of limestone cliffs formed by the quarrying operations of the lime company at Norlim, less than a quarter of a mile from the site of the Dart find. The occurrence of the stratum more than 100 feet below the top of the limestone mass gives impressive testimony as to its great age.

More than 150 feet of the fossil-bearing rock stretches along the base of the quarry cliff, but the fossil finds here have not been numerous to date.

The lime company has been extremely co-operative and has set aside all of the rock quarried from this level for examination by Dr. Camp and Dr. Peabody before disposing of it. Blasting operations uncover new sections of the deposit about once every three weeks so that new finds will be slow and it may be months before significant specimens are added to the antelope and bone fragments found to date.

The geological formation indicates that the fossils found in the presumed early pleistocene rock may represent creatures entombed after falling into deep fissures. While its full significance must await further discoveries it is already certain that the discovery will add materially to the all-too-fragmentary picture of the South African ages.

MIDDLE ZONE

In the middle zone, which yielded Australopethicus, the Californian scientists have found numerous baboons of the Parapaio Africanus type in the hard, pink breccia. Dr. Peabody discovered six well-preserved baboon skulls in a single chunk of rock measuring no more than 18 by 24 inches. In addition, the level has produced finger bones of the baboon, usually extremely rare, a wide variety of rodents, antelope and carnivores, many of which were found by Dr. Robert Broom during his brief excavations at the same site.

In spite of the important specimen it gave to science, the site of Australopethicus has been worked but briefly in the last 20 years. In addition to Dr. Broom's work, brief excavations were made by the late Professor Ales Hrdlicka, Professor Dart and some of the latter's students. The quarrying operations have now obliterated large sections of the deposit. While the pink breccia is not used in the kilns, it has been piled in dumps and is virtually unavailable.

Dr. Camp and Dr. Peabody have removed more than 200 cubic yards of rock by blasting to expose deposits containing the new specimens.

The discovery of additional skulls or skeleton remains of the near-human will require a tremendous amount of labour, with a generous portion of good fortune thrown in.

UPPER LEVEL

The most prolific of the three ages of cave deposits so far has been the upper or more recent level.

In several newly-discovered locations, the Americans have found a rich fauna which promises to add materially to the knowledge of South Africa's pre-historic ages.

Four sub-levels have been exposed, covering the period from Australopethicus to the late pleistocene. Dr. Camp and Dr. Peabody are now classifying and identifying several hundred fossils found in the four sub-levels and declare that they

(*Continued on page 37*)

NEW M/M APPROACH

BY LLOYD M. DEMRICK

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Micromounting is a form of collecting that has a thread of devotees throughout mineral collectors. What they lack in numbers, they more than make up for in zeal and fun.

For the benefit of those readers who do not know what a micromount (M/M for short) is, I shall give the following brief description.

As its name implies, the minerals are small—so small that to appreciate them it takes at least a 15 power magnification. These tiny specimens are real fairylands—much more perfect crystals and better combinations of minerals; often three or more kinds of crystals on a specimen the size of a match head. An apple box in size will hold a m/mter's equipment, collection and ore to be *mined* for more specimens.

The heart of any m/mter is his microscope, nearly always the stereoscopic, two-barrel type with one or more nose pieces producing magnifications in the approximate range of 15 to 35 diameters. Twenty power seems the best all-around single power. The little cardboard box, some 7/8" square in which is placed the cork or balsa pedestal with the specimen fastened on top, is easily obtainable from a few sources, or can be made by hand. Tweezers, hammer, crusher, etc., can be gotten but the heart of m/mting, the Stereoscopic microscope, is extremely difficult to get at any price; new ones being quoted (about one year delivery) at around $250.00 and up. That is the real reason there are so few m/m bugs.

The beauty and endless variety of these tiny specimens had always intrigued me, and out of my groping and blundering at m/mting from a different and less costly angle, the following described "setup" evolved.

In this case the cart came before the horse. I'd bought several small steel boxes from a war surplus store, about 8" x 10" x 2" deep. In the bottom of each was a sheet of 1/4" masonite with rows of 1/8" holes in which had been placed dental burrs for storage and shipping. In one box I put my few small burrs and grinding points in a nice row and thought nothing of it.

But one day while examining one of the burrs with a strong glass to see if it was dulled, a questioning idea popped in my head—how easy to inspect that burr and turn it between my fingers while examining it—how about a m/m on the end of a li'l stick.

Forgotten was the burr as I hurridly dug loose a bit of matrix that I knew contained a few tiny tetrahedrites and dogtooth calcite. This pea sized specimen I glued on the end of a bonfire type of match and reached for my 15 power triple aplanat.

It worked. With the triplet close to my eye and my left hand holding the match-mounted specimen, resting on my nose for stability, I slowly rotated the match in focus and found the tetrahedrite and dogtooth displaying themselves beautifully.

Ah! This looked like a possibility. I broke the match off to a shorter length and stuck it in one of the holes alongside the burrs in the box. As I mused I thought I could see one of the dogtooth calcites lean over to a tetrahedrite and murmur "Now if we just had a home of our own and a lot of company. . . . ."

They now have company—lots of it. I got some 1/8" dowels and cut them off to a length of 1 1/2" and glued my specimens onto these. A bit of paper some 3/8" wide I glued around each dowel and numbered it; a corresponding number being marked next to its hole in the box. A reference list gives complete information regarding each specimen.

Any small shallow box with a bottom board drilled with holes of a size so the dowel pins will easily fit may be used. Do not have the holes closer together than say 3/4 of an inch or difficulty will be encountered in lifting the specimens out, even with the use of a pair of tweezers.

For anyone wanting to take a try at m/mting from this approach I'd like to say the optics are the heart of its satisfaction. Do not try it with less than a 14 or 15 power triple aplanat. The triplets used to cost $7.50, but now are $12.00. A cheap glass, even with 15 power, will prove disappointing—give those beautiful micromounts a real chance and they will reward your every minute spent with them.

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BLUE BARITE NEAR STERLING, COLORADO

BY GUY B. ELLERMEIER

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Eastern collectors who attend the First Annual Convention of the newly organized American Federation of Mineral Societies to be held in Denver during June, 1948, are likely to enter Colorado via either U. S. Highway 138 or U. S. 6. Both roads lead to Sterling in the northeast part of the state. From Sterling they may as well continue west on State Highway 14 about twenty-five miles to the little village of Stoneham and the blue barite deposit located about three miles northeast of the latter town. This deposit is mentioned by Dana, and is accessible by automobile. However, the visitor should not rely upon obtaining information from the village inhabitants; he will likely know as much about there being a barite deposit as they will.

From Stoneham you will drive east nearly a half-mile on State Highway 14 to where a dirt road leads north. Follow this dirt road about two miles, or until you cross a cattle-guard. Then, inclining to the right from the road, follow the ruts through the sage brush in a wide half-circle until you arrive at the brink of the declivity on the slopes of which the barite occurs. The crystals may be picked up along the steep slopes of the bluffs where they have weathered out to lie amid soft, friable talus.

The barite occurs in a light yellow, nearly white, rocklike, limey-clay material that has resulted from the alteration of a Tertiary volcanic ash. During the Tertiary Period our Rocky Mountains were subjected to recurrent uplifts and warpings, accompanied, especially during the Oligocene Epoc, by considerable volcanic activity. Streams, continually rejuvinated by the repeated arching of the Front Range, transported and deposited sediments, especially ash, far out upon the plains in the form of mud terraces. Later in Tertiary times the terraces were covered over with coarse gravels (arkosic) derived from the exposed granite peaks of the mountain range off to the west. At the barite locality erosion has removed most of the overlying gravel, while recent flood waters have cut two deep gulches, each over a quarter-mile wide at the steep headward extremities, into an exposed old ash terrace to form bluffs of considerable extent. Because of their color and limy-kaolin texture, they are sometimes locally referred to as "chalk" cliffs.

Broken crystals litter the slopes of the bluffs, and by diligent search many terminated crystals may be found. They range in size from a half-inch in length up to three or even four inches. The color varies from grayish-blue to a light blue. Some small crystals are as clear and fine in color as aquamarine which they much resemble, except for crystal habit, and all are translucent. If one is equipped with pick and shovel, a crevice in the cliff wall may yield clusters and a considerable quantity of the larger sized crystals. With extremely good luck one may find a barite "rose". The latter are more likely to occur high up along the slopes, just below the escarpment.

DEVELOP FIRST AUTOMATIC RECTIFIER FOR PHOTO MAPPING

ROCHESTER, N. Y.—An automatic focus rectifier for mosaic map making, the first ever to be produced in America, will be delivered this week to Army Corps of Engineers, Bausch & Lomb Optical Company announced December 3, 1947. The new photogrammetric instrument will be of paramount significance in planning national thruways, soil erosion studies and flood control, company official said, in addition to aerial reconnaissance work.

Resembling an ordinary photo enlarger, it simultaneously enlarges, prints and automatically reduces aerial photographs to a common scale and level, correcting the tilt encountered as a result of the plane's variation in angle and level at the time photographs are taken. Planes equipped with the most modern stabilizers can maintain a constant level only to within one-quarter degree accuracy, making the rectifier vitally necessary in production of precise aerial photo maps.

Equipped with push button controls, the automatic instrument can be operated by a photographer, turning out rectified prints on a production line basis at the rate of one every five minutes. Previous non-automatic rectifiers required tedious, involved mathematical calculations for each individual photograph.

Mathematics, mechanical design and many features of the new engineering instrument were worked out by John V. Sharp and Olin W. Boughton, Bausch & Lomb scientists, while optical solutions were contributed by Dr. Konstantin Pestrecov and Harry G. Ott, also of the firm's research and engineering staff.

Designed around the requirements of the Corps of Engineers, the rectifier will be available for commercial use next year. Small enough to be mounted on a trailer truck for use in field work, it has fluorescent illumination, an enlarging lens of high optical resolution, and is constructed to maintain constantly the proper alignment between the negative and printing easel.

Three push-buttons control tilt, magnification and swing. The first operates a device which compensates for the tilt of the plane, and can accommodate tilts as high as 20 degrees.

A second button regulates magnification, automatically bringing photos taken at varying elevations to desired map scale. The remaining button controls swing, re-establishing in the instrument the plane's angle of deviation from its true course.

Photographs of terrain printed with the new rectifier are so sharply defined, they give an almost three-dimensional effect.

AN INTERESTING ROCK DUMP IN ELMSFORD, NEW YORK

BY DAVID B. SABINE
Yonkers, N. Y.

As very amateur rock-hounds, my daughter and I treasure the most common-place specimens which we ourselves have found and identified, far above the finest samples we acquire by other means. For those living in the Metropolitan New York area, who feel as we do, there is a veritable treasure trove near Elmsford, New York. This rock dump is located about three hundred yards north of the intersection of Routes 100A and 100B, on the right hand side of the road. It is exactly two miles east of Woodlands Lake on Route 100B. Although we found nothing startling, in less than fifteen minutes we picked up nice specimens of hornblende, orthoclase, plagioclase, biotite, garnet, magnetite, and epidote. Had we been more suitably clothed, we could undoubtedly have found more. We can highly recommend this as a short field trip which yields interesting returns.

Editor's Note: It is good to hear that the above dump (from Aqueduct Shaft 20, abandoned) still produces interesting minerals. This locality was described by Miss Evelyn Waite in the October, 1940, *Rocks and Minerals* (New Localities in Westchester County, N. Y., p. 328).

KING ARTHUR STILL LIVES AT TINTAGEL!

The ancient ruins of King Arthur's Castle on the heights above Tintagel, Cornwall, England. Note the stone "face" on the extreme right of the picture.

Tintagel or King Arthur's Castle, is one of the most famous places in Cornwall, England. The locality is a wild, rocky area on whose heights are the ruins of an ancient castle or stronghold which legends say was the birthplace of King Arthur, the son of Uther Pendragon and Ygrayne. King Arthur, a semi-fabulous English hero and king, is supposed to have reigned about 500 or 550 A.D. He is celebrated as the "King Arthur of the Round Table" and his exploits were favorite themes of medieval knights and minstrels.

Tintagel (or Trevena), a small village of about 1,500 population, is on the northern coast of Cornwall in southwestern England. It stands on a bare plateau, close to the sea, and rising above Tintagel Haven or Porth, a narrow cove surrounded by cliffs of black slate. It is a favorite locality for tourists, whose chief attraction are the ruins, which are built partly on the mainland and partly on a rugged promontory ("island") united by a narrow peninsula to the shore. The ruins are about ½ mile west of the village.

There are slate quarries around Tintagel and so the locality is noted also for minerals, most of which are found in the quarries while others are found in the cliffs. Among the minerals found at Tintagel are:

Albite: In white translucent crystals with calcite and rock crystals, sometimes with hairlike crystals of rutile.

Anatase: At Tintagel Cliffs associated with rock crystals and adularia.

Calcite: Crystals and lamellar masses.

Orthoclase (*Adularia*)*:* Crystals.

Quartz (*Rock Crystal*)*:* Beautiful, clear crystals are found at the slate quarries and in the cliffs.

Rutile: See albite.

Just before the last World War, Mr. T. O. Lisle, of New York City, visited Tintagel and took a picture of its famous ruins. Later, after the picture was developed, he noted to his astonishment that a "face" was visible in the cliff on the extreme right of the picture. The outline of the cliff face makes a perfect profile of King Arthur himself, complete with crown and beard.

When sending in the picture for printing in *Rocks and Minerals,* Mr. Lisle wrote:

"Never in England have I seen a similar picture and none of the the local guide books refer to the resemblance or to the fact that a face is revealed. The photo has not been retouched in any way".

Luray Cave of Virginia

Luray Cave, in Page county, Virginia, in the Shenandoah Valley, was discovered by Andrew J. Campbell and others in 1878. It is much smaller than the Mammoth Cave of Kentucky, but is remarkable for the great number and beauty of the stalactites. The cave is visited each year by a large number of tourists. Plan to visit it in 1948.

THE GREATER MUSEUM

Paterson Museum Curator Wm. C. Casperson Enlarges On Future Aims*

Throughout the country there is rapidly developing a consciousness of the need for facilities for the advancement of education and culture and development in the arts and the sciences. To fulfill this need the consensus of opinion recognizes the modern museums as the establishment of a center of education and culture where the various interests in civic life and the intellectual and spiritual welfare of the public can be served.

The activities of a modern museum reaches practically every field of human welfare. It affords the students and teacher, and the general public as well, an opportunity to gain knowledge through actual contact and experience. The museum is a storehouse of information through its exhibits of the best fruits of the arts and sciences to be found. It also offers information and help in the solving of many problems in the fields of scientific and industrial activity. Not only is the modern museum useful in imparting knowledge and advancing culture, it also offers to all citizens with creative genius the opportunity for the full expression of their talents. When adequately equipped the modern museum with its vast storehouse of practical knowledge, its many activities, and its facility for the expression of creative genius, becomes one of the community's greatest assets.

The Paterson Museum has realized the necessity for a greater museum in the city to serve as a cultural center of the vast area of Northern New Jersey with its potential resources and its strategic location in our nation. Several articles have appeared in the local newspapers in support of this objective, and Science Monthly, distibuted by the museum, has contributed several articles advocating the greater museum. Where such a museum building should be located is a problem for future consideration.

It is evident that the movement for a greater museum is growing in strength and popularity. Several groups, in addition to the Paterson Museum, have become recently interested in creating such a center of education and culture for the advancement of the arts and sciences; and sentiment in favor of the greater museum is rapidly becoming crystallized into reality.

Important at this time is the cooperation and co-ordination of the various groups interested in the movement and which have expressed such interest by actively organizing for the objective, and the formulation of a co-operative program for carrying through the plan for the greater museum.

Plan Suggested

In support of creating a greater museum in Paterson, the following plan is offered: The greatest public interest can be served by creating in the City of Paterson a greater museum with facilities for the advancement of education, culture, and the arts and the sciences. This broad objective covers the various arts and sciences and a multitude of activities which can only be carried out through a well equipped modern museum. The Paterson Museum is already established as an institution with a wide variety of scientific interests and activities. Its over-crowded condition makes it imperative that larger facilities be secured as soon as possible. The Paterson Museum can be used as the nucleus about which a greater museum can be built. Additional activities can then be added to the present activities. At present a large mineral society is affiliated with the museum with nearly 100 members. Art associations may become affiliated and take advantage of the facilities of the museum to function in this special branch of activity.

Other societies are awaiting to be formed, and it is only the lack of help which has hindered the formation of an Archaeological Society, a society in astronomy, a Biological Society, and a Paleontological Society. These can and should be organized right now.

The over-crowded condition of the Paterson Museum is well known to all those who visit the institution. In the

2,250 square feet of floor space there are approximately 20,387 specimens on exhibit and another 20,000 specimens in storage. The entire value of the collections will approximate $50,000. These specimens' to be properly exhibited, should require at least ten times the space now available. This condition makes it imperative that a greater museum be secured to serve the public welfare.

Another factor to be considered in the movement for a greater museum is the extent of the museum's activities. The museum in the city of Paterson extends its usefulness over the entire area of Northern New Jersey, and a program should be adequate which will afford this large area the opportunity to assist in the support of the greater museum and to receive commensurate benefits therefrom.

Organizing Museum Association

To inaugurate and to further the plan for the greater museum, in co-operation with the city institution, it is proposed to organize a museum association composed of those groups and citizens already interested and active in the movement and all representative groups and citizens who may become interested in the movement and thus effect a medium through which the greater museum may be made a reality.

This association shall be composed of members and shall be under the direction of a board of trustees composed of representative citizens from the various communities of Northern New Jersey. These trustees shall be empowered to receive gifts and bequests and various sums of money and shall administer the funds for the interest of the greater museum. In this way the museum association and the city of Paterson can work together and this joint operation shall constitute the greater museum.

The various groups interested in this movement will be called together in the very near future at which time the details of a program will be worked out. We cordially invite all who are interested in this movement to correspond with either Thomas H. McKiernan, Sr., of the McKiernan Art Center, or William C. Casperson, curator of the Paterson Museum, or Robert Williams, chairman, Paterson Museum Board of Trustees.

* Reprinted from *The Call*, Paterson, N. J., Nov. 10, 1947.

THE VAN MINE OF WALES

BY W. E. HOWARTH
Cardiff, Wales

Over most of the counties of Cardiganshire and Montgomeryshire, Wales, the rocks exposed at the surface (where there is no superficial drift cover) are Lower Silurian (Valentian), but folding brings up Ordovician rocks to form three main inliers in the northern part of the area. A system of N.E.-S.W. faults has been mineralized, the predominating minerals being galena and blende (sphalerite) with subordinate chalcopyrite.

During the second half of the 19th Century, the area was very productive and 127 mines were opened, 70 of which each produced more than 500 tons of ore. The most productive were the Van and Dylife mines in Montgomeryshire, and the Frongoch, Cwmystwyth, Esgairmwyn, Daren, Glogfawr, Goginan, and Logauvas mines in Cardiganshire.

The Van mine is situated on the east margin of the most easterly Ordovician inlier on one of the richest lodes called the Van lode. Here the workings were mainly in the upper part of the Ordovician. It was worked from 1866 to 1917, and during that period produced 96,739 tons of lead ore, yielding 75,400 tons of lead and 771, 557 ounces of silver, and 28,424 tons of blende (zinc yield not recorded). It was extremely prosperous for a time. After exploration of the lode, a company was floated in 1865 with 12,000 shares at £4-5s a share, and the lode proved so productive that five years later the shares were quoted at £84 each, but later increase of capital caused a decline in the market value of the shares.

The whole area is worked out and by 1945, all mines had been abandoned.

The Van mine is 2¼ miles N.N.W. of the town of Llanidloes, Montgomeryshire, Wales.

BARIUM IN CALIFORNIA*

Barium (Ba) is a soft, silvery white, metallic element resembling lead. Its characteristics are: atomic weight, 137.4 atomic number, 56; valence, 2; melting point 850° C; specific gravity, 3.5 at 20° C. Metallic barium, like other alkali earth metals, decomposes water upon contact. Demand for the metal is small, but two of its natural compounds are marketed in considerable volume.

Barite ($BaSO_4$), the commonest and most abundant barium mineral, usually is colorless, white, grayish white or yellowish white and transparent to transluscent. Massive granular aggregates and well crystallized masses are common both as gangue in metalliferous veins and in irregular bodies and cavities in sedimentary rocks. Barite is best distinguished from other light-colored minerals, with which it is apt to be associated, by its high specific gravity (4.3 to 4.7) inertness to acids, three-directional cleavage (not rhombic) and tabular crystal habit. It belongs to the orthorhombic crystal system and is further characterized by a hardness of 2.5 to 3.5, a brittle uneven fracture and white streak.

Witherite ($BaCO_3$) is the only other barium mineral abundant enough to utilize economically. It often resembles barite, but effervesces violently in acids and is more commonly found in parallel crystal aggregates than in euhedral groups. Mineral associates are likely to be the same as for barite. The commonest of these are simple metallic sulphides, calcite, celestite, fluorite, anhydrite, gypsum, and iron oxides.

Barite is distributed widely through California, but workable deposits are not plentiful. The following localities have produced barium ores from time to time: Inyo County, in the Alabama Hills near Laws, and in Gunter Canyon 6 miles northeast of Laws; Los Angeles County, from the west fork of San Dimas Canyon north of the town of San Dimas. Greatest production to date has come from properties in the vicinity of El Portal in Mariposa County where a number of operators have marketed ore over a considerable period of time. Both barite and witherite are mined there. In Nevada County, the Democrat barite mine located 7 miles from Dutch Flat, and the Spanish barite deposit 5 miles west of Graniteville (on the old North Bloomfield ditch) are worthy of note. Two properties about 5 miles from Almanor Siding on the Western Pacific Railroad in Plumas County have produced barite in some quantity. A great many properties have been worked from time to time to the northeast of Barstow in San Bernardino County. La Brea deposit in Santa Barbara County, located 20 miles northeast of Sisquoc on the north fork of La Brea Creek, has produced from time to time.

Mining of barite in California is predominantly of underground type although much surface hand mining and some surface mechanical mining have been done. The El Portal operators have utilized mill hole, drifting, and stoping methods. At the Democrat barite mine early operators used open-cut methods. Later crosscut adits were developed and raises to the bottom of the old cut made. At the Barium Queen mine near Barstow ore was removed from a 250-foot tunnel and six shallow shafts. In the Hansen deposit at Ludlow, stoping from a 250-foot tunnel driven 60 feet below the outcrop has resulted in recovery of a body of ore 150 feet long, 60 feet deep, and from 3 to 14 feet wide.

Preparation of crude ore for market usually embraces hand picking and (or) washing to separate adhering foreign materials. Barium minerals are often coated with oxides of iron and other mineral encrustations. Since the price obtained is partly dependent upon whiteness of the crude ore, bleaching in acids may be advisable. Foreign matter may be separated by washing, rattling, jigging, flotation, logwashing, and soaking in acid. In case of witherite ore, acids are not used as cleaning agents. Off-colored ore can be used in the manufacture of colored paints and drill mud but brings a lower price. After impurities are removed (which may

* Reprinted from California Division of Mines, Information Circular No. 26, Nov. 1, 1947.

entail crushing), barium ores are finely ground and either used as such in drill muds and fillers or converted chemically into re-precipitated barium sulphate and other barium compounds. Most barite must be so ground that 98% passes a 200- to 300-mesh screen. Two types of barite are recognized in the trade—the hard crystalline variety and the softer, more friable type. The latter is most in demand because of advantages in grinding and removal of impurities.

Because of its weight, ground crude barite is used extensively in well-drilling muds to prevent blowouts when confined gas is encountered. Prior to its utilization in Baroid and other drill muds, the principal use of barium sulphate was in the manufacture of lithopone, a white pigment. Barite is used in finely ground form as a mineral filler in a great many industries but most abundantly in the manufacture of paper, linoleum, rubber, oil cloth, textiles, wall paper and prepared roofings. Barium compounds also figure in the manufacture of pharmaceuticals, special cements, artificial stone, insecticides, foundry faces, ceramic glazes, glass, X-ray insulation, munitions, pyrotechnics, battery plates, and mordants.

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NEW YORK ROCKS IN CHICAGO MUSEUM

To most people a pile of rocks is—just a pile of rocks. To some people who have transgressed the laws of society, a pile of rocks is something to occupy their time and muscles in a prison yard. But to Dr. Sharat K. Roy, chief curator of geology at Chicago Natural History Museum, each rock may be revelatory of some new fact in science, and a pile of rocks is something to make his heart beat on the double.

Consequently Dr. Roy was all smiles when he returned to his post at the museum in early November, 1947, with a small truckload of igneous rocks collected in the Adirondack region by the geology expedition to northern New York of which he was leader. "Igneous" rocks are those resulting from the cooling of magma or molten rock matter.

Of course, Dr. Roy is highly selective about the rocks he collects, gathering only such specimens as attract his attention while trekking for miles in the mountains searching for those which display special features relating to erosion, metamorphism, fission, and other phenomena which occur to rocks during the course of millions of years which, to a geologist, represent only a comparative few minutes in time. Dr. Roy was accompanied on the expedition, which began in July, by Harry Changnon, assistant curator in geology.

On this trip Dr. Roy paid particular attention to the study of ultra basic rocks which are apparently very similar to stony meteorites. Meteorites are Dr. Roy's specialty and his field studies of terrestrial rocks are a prelude to the understanding of the mode of origin of the meteorites.

The rocks will be sorted, identified, classified, and some of them will be added to the museum's exhibits pertaining to physical and economic geology while others will go into the institution's scientific research collections.

DR. BADER ON "ICE CRYSTALS AND THE SNOW AGGREGATE"

BY CHARLES A. BELZ, Secretary
Philadelphia Mineralogical Society

To quote Dr. Bader, "We all know that ice and snow cover considerable portions of the earth's land and sea surface, but we may not know the extent of our ignorance of the properties of ice and snow". There is surely no ignorance greater than that which is not even aware that it doesn't know. There is a corresponding amazement, and to a modest mind at least, a somewhat sheepish delight when someone turns on a light in a never before explored, nor even suspected dark corner of our ignorance. Dr. Bader accomplished just that when he addressed the Philadelphia Mineralogical Society on "Ice Crystals and the Snow Aggregate". Dr. Henri Bader is at the Bureau of Mineral Research at Rutgers University, but at one time was a member of the Committee appointed by the Swiss Federal Institute of Technology at the instigation of the Swiss Government to undertake systematic scientific research on snow and ice. The need for a scientific approach to the problem became apparent after a commission of foresters and geologists vainly sought a solution to the problem of avalanche control, and as a consequence, a committee of two civil engineers and a mineralogist was appointed to carry on that work. Dr. Bader was the mineralogist member of that committee. Study began about twelve years ago in a lofty Alpine laboratory, and similar studies are being made to a limited extent in many parts of the World.

Dr. Bader's talk produced ample evidence that snow and ice are interesting mineralogical subjects, not merely frozen water, or frozen moisture precipitated from somewhere in the upper regions to become a very great annoyance to the suburban property owner, the State Highway Supervisors, and the urban transit systems.

Ice is a crystalline phase of H_2O. Seljakov in 1936 published a paper in the Transactions of the Academy of Sciences in the USSR stating that he had found two modifications by X-ray analysis. One is alpha ice with a possible symmetry of D_{6h}, D_6, D_{3h}, or C_{6v}. With an axial ratio c/a of 1.62. Beta ice on the other hand has an axial ratio c/a equal to 1.36 and a symmetry of C_{3i} or C_3 and presumed to be the product of undercooled water freezing at temperatures below -5° C.

At about same time, Nakaya in Japan described ice crystals showing typical rhombohedral forms consistent with Seljakov's beta ice of symmetry C_{3i}, but not possible in the class C_3. Dr. Bader's own observations on prismatic trigonal crystals showed that they were hemimorphic, possible in C_3 but not in C_{3i}. Thus the exact nature of beta ice is still in question, and much more work needs to be done on this problem because beta ice may occur as sea ice, crystallizing at low temperatures.

It is almost certain that most land ice and snow is of the alpha type. Nothing has been noted so far to warrant an assumption that there may occur any other modifications in nature. The structure of alpha ice has been found to consist of two interpenetrating rhombohedral lattices. This strongly polar development of many ice crystals is accounted for by the fact that the water molecule is a strong dipole parallel to the c-axis, and the polarity or hemimorphism of these crystals is so pronounced that they may be evaporating at one end while growing at the other.

The greatest variation of crystals shapes occurs in falling snow. At low temperatures and low saturation of the air, the commonest habit is prismatic, being pointed at one end and showing a negative point or cavity at the other. They are combined in various ways as intertwined groups, always joined however at the pyramidal end. While twins also are found, they invariably occur with (0001) as the

twinning plane. Extreme prismatic habit in the form of long needles such as may be found in other mineral forms is less common.

At relatively higher temperatures and higher super-saturation, there occurs a radical change in habit from prismatic to the tabular. They are very thin, the diameter usually exceeding ten times the thickness. The secondary axis of the hexagonal coordinates dominates so strongly that the polar character of the main axis is no longer evident. When the growth is slow, the result is a hexagonal plate. When the growth is rapid, the development is principally along the secondary axes with consequent impoverishment of the sextant between the axes and a consequent retarded crystalliation,—the well known star being the result. The pattern of crystallization along these axes shows great variation in the development of rays, spurs, and even spurs upon spurs, all of course parallel to one of the axes, thereby producing a regularity in design despite a seemingly endless number of variations. Here we find the well known snow stars so often used in illustration to astound the popular science readers by the great wonders of nature. While snow crystals are unique and unquestionably of intricate design, they aren't quite as glamorous as represented. There are as might be anticipated different combinations of tabular and prismatic forms, irregular crystals, and crystal groups an interesting one being the form originating in frozen cloud elements. Water droplets which form clouds are frozen as tiny spheres of ice. Such small bodies fall slowly, and in their descent are picked up by larger crystals to form small fluffy balls known as "graupel".

Of the physical properties of ice, the one which is most important in interpreting the behaviour of snow is its high vapor pressure over a wide range of temperature. It is 4.6 mm at 0°, 1 mm at -18°, and still around 0.3 mm at -30°. This property indicates that ice crystals in contact with the atmosphere will always react to any change in the humidity of the air. They will grow if the air is super-saturated, and evaporate if it is less than saturated with water vapor.

When it snows, the crystals formed in a super-saturated atmosphere pile up on the ground in a loose, very porous aggregate, having a very large internal ice surface exposed to the air in the pores. The porosity of new dry snow is usually about 90 per cent. With such porosity, the pores are practically in communication with each other, and the air contained is always saturated with moisture corresponding to the vapor pressure of ice at the prevailing temperature of the snow. In this combination of high vapor pressure for ice, and high porosity for snow lies the explanation of the phenomena, observed probably by everyone, that snow seems to disappear despite the fact that there has been no melting. The obvious explanation is shrinkage, and the mechanics of this shrinkage is described by Dr. Bader as follows: A fresh fall of new dry snow is a heaped mass of single crystals leaning against each other in all possible positions throughout the snow blanket. As they loose their extremities the centers of the crystals must approach each other, and the whole mass shrinks. This loss of extremity is not caused by structural fracture but by a metamorphosis due to the high vapor pressure of ice even at low temperature, and the irregular shape of the ice crystal in contact with the entrapped pore air. The vapor tension, that is the activity of water molecule interchange from vapor to solid is more intense at the projecting or convex extremities than at the flat or concave boundaries of the crystal. This difference in vapor tension, slight as it might be, is sufficient nevertheless to alter the shape of the crystal. Dr. Bader exhibited slides showing this deterioration and the progressive loss of star ray extremities and the apparent migration of ice molecules to the center. Mass shrinkage is accelerated by the total disappearance as separate entities of the smaller crystals. The fluffy new snow become a settled granular snow.

If this were the only factor operating in the shrinkage of snow, we would expect cracks to form since shrinkage takes place in all directions, and we should have the appearance commonly seen in a

dry mud flat. We do not see such cracks however due to another physical property of snow, that of plasticity. Plasticity in any solid is the property of slow continuous deformation under stress, even though the stress might be comparatively slight. The deformation takes place without loss of coherence or sudden collapse of the snow structure. The load causing plastic flow consists of its own weight and that of overlying snow layers. Under these pressures the snow constantly tends to spread laterally unless confined thereby making the formation of shrinkage cracks impossible. On slopes, it actually creeps down hill.

Large masses of solid ice such as ice sheets and glaciers flow like a highly visceous liquid. This plasticity is partly due to shearing along the grain boundaries, but the major factor seems to be a translation parallel to the basal planes of the hexagonal crystals. The major part of the deformation in a snow mass however is to sliding at the points of grain to grain contact. It is a further peculiarity of snow that at the points of grain contact there is a certain amount of cohesion, they don't simply lean against each other. This has been proved by experiment. A core of snow, unbelievable as it may seem, has a measurable tensile strength amounting to as much as 10 pounds per square inch. Dr. Bader was emphatic to point out that in all of this discussion that cold dry snow is the kind of snow described, and the familiar properties of snow and ice associated with melting under pressure, congealing and other phenomena associated with changes from solid to liquid state are not to be confused with the properties of dry ice and snow. The tensile strength is not due therefore to a possible melting and resolidification at grain contact, but to some other kind of cementing which does not occur in a granular mass such as sand for instance.

It is interesting to note that all of the factors contributing to the metamorphism of snow tend to decrease its porosity. Snow becomes more dense no matter what is done or even if nothing is done to it. Even in the tensile test experiments, it was noted that with the elongation of the specimen under stress, in addition to the usual "necking in" of the specimen, it was found that the longitudinal sectional area after elongation was less than before the test was commenced proving an actual increase in the density of the specimen.

In the natural course of events, spring arrives and the snow begins to melt. It always melts from the top, and the melt water percolates through the mass, and very soon the entire mass is at a temperature of 0°C. In connection with this there is another so far unexplained phenomena of nature. As the snow melts, the grains become larger, and the coarsest snow is found at the end of the melting period. Dr. Bader observed that there is very much still to be done in the study of snow and ice. Proper study requires among so many other things a large number of thin sections the preparation of which is a very delicate operation requiring much skill and experience. Work must be done in highly specialized refrigerated laboratories under particularly difficult working conditions and requiring much expensive equipment. So far most of the work on snow and ice is done on an engineering level where the great concern is on snow and ice removal in congested areas, precipitation of snow and ice on aircraft and power lines, snow surveys for river flood predictions, and associated problems. Much of this work is being done without sufficient regard for the physical properties of snow and ice, and the results are not as good as they should be. Eventually the necessity of pure scientific research in these fields will be realized at the levels where decisions are made.

WORLD NEWS ON MINERAL OCCURRENCES

(Bureau of Mines **Mineral Trade Notes**, August, 1947)

I. METALS

BAUXITE

Malaya.—Production of bauxite began in November 1936, when the Ishihara Sangyo Koshi opened a deposit at Bukit Pasir Mas near Batu Pahat. In 1937 the Perigi Achih mine at Kim Kim was opened, and exports from Sri Medan at Batu Pahat began in 1938. These three mines, all in south Johore, were the only producers of bauxite up to 1941.

The Bukit Pasir mine is about 3 miles north of Batu Pahat, on a small mound 16 to 18 feet above sea level. The deposit is roughly lenticular in form and about 26 chains (1,716) feet long and 12 chains (792 feet) wide. Ore reserves were estimated by Ishihara Sangyo Koshi at 450,000 tons. The ore is bauxite consisting mostly of gibbsite.

The Higashiyama (Sri Medan) mine is 10 miles north-northeast of Batu Pahat and is directly east of the iron-ore deposit at Sri Medan. It was mined by Ishihara Sangyo Koshi, Ltd. The deposit occupies approximately 250 acres of undulating country. Irregular patches of high-grade ore are intercalated with lower-grade ore. Ore reserves were estimated at 230,000 tons, 70,000 tons of which have been mined. Bauxite underlies laterite as a bed averaging 12 feet in thickness and ranging from 5 to 20 feet. The top few feet of bauxite consist of high-grade ore.

The Perigi Achih mine near Kuala Kim on the mainland opposite Pulau Nanas covers approximately 120 acres. Bauxite occurs as concretions in a yellow to red clay and comprises about 50 percent of the deposit. Mining operations began in March 1937.

The following mines were operated during the Japanese occupation:

Malacca mine (Telok Mas) at Bukit Sebarang, about 7 miles from Malacca, was prospected by the Japanese in 1939, but no mining license was issued. The Japanese Military Administration ordered work to begin in May 1942. Most of the equipment was brought from the Higashiyama (Sri Medan) mine and some from Japan.

The Nangan mine, 10 miles east of Kampog Pengerang, covers a large area. Bauxite was found in 1935, but no proprietary rights were issued. The area is estimated to contain 10,000,000 tons of bauxite, and a development program envisaging a production of 500,000 tons annually was inaugurated. Nonarrival of machinery from Japan caused the plan to be discontinued, although equipment from the Kemaman iron mine was transferred to the area.

Prospecting carried out by the Japanese companies and by Aluminium Laboratories, Ltd., during 1939-41 has shown occurrences of bauxite at other localities in Malaya. Although bauxite is widespread, it occurs in some areas in insufficient quantity and of too-low grade to be payable. Localities where bauxite was found follow:

Area east of road 62½ and 63 milestone, between Ayer Hitam and Yong Peng. Bauxite concretions occur on road and on hilly country nearby. Analyses of samples collected showed a high silica content.

Sungei Pendas Estates, Mukin Pulai. This area was prospected by Aluminium Laboratories, Ltd. The bauxite, which varies in quality, occurs in red clay, and is usually covered with up to 4 feet of clay and lateritic material. Bedrock is stated to be carbonaceous shale.

Grant 2427. Mukin Lenga, Muar district. An area of 30 acres is said to contain a deposit of bauxite ranging from 4½ to 5½ feet in thickness.

Bukit Bindu and Bukit Tunggal, 7 miles northeast of Batu Pahat. Bauxite was found in this area in 1941, but it was thought not large enough and was too low grade for profitable mining.

Bauxite of commercial grade has been found in Bukit Gennum, Sungei Kenbar, Anak Sungei, Endau, Pahang, and the area is said to merit further prospecting. (Consul John S. Richardson, Jr., Singapore.)

CHROMITE

Cuba.—The Caledonia mine, sole producer of metallurgical chromite in Cuba,

yielded 1,347 long tons of ore during the second quarter, compared with 1,550 tons in the first quarter of 1947.

MANGANESE

Cuba.—Production of metallurgical ore at the Charco Redondo mine in Santa Rita, Oriente Province, is reported to have been approximately 10,000 long tons in the second quarter of 1947. Unconfirmed information indicates that the Taratana mine in El Cristo, Oriente, which was reopened in April, produced 228 tons in April and 526 tons in May. The ore is lower-grade than that produced at Charco Redondo.

Investigations are being made to determine the commercial value of pyrolusite deposits reported to have been discovered in Gibara, Oriente.

Gold Coast.—Manganese ore has been found in many places in the Gold Coast. Numerous small deposits are known to exist in the western part of the Northern Territories, but only the Nsuta deposit is being worked at present.

The Nsuta, or Insuta, mine (also known as the Nsuta-Gaywin manganese concession) is near Nsuta at 5° 17' N., 1° 58' W., approximately half a mile east of the Takoradi-Kumasi Railway. Manganese was first discovered at Nsuta in 1914 by the Gold Coast Geological Survey on land that had been leased in 1910 to Fanti Consolidated, Ltd. After the discovery, a subsidiary, the Wassaw Exploring Syndicate, was formed to prospect and exploit the deposits. The concession was taken over by the African Manganese Co., in 1923.

The Dixcove deposits have been exploited by the Yakua Manganese Co. Ore has been taken from excavations on the slopes of two hills--Yakau and Himakrom—about 4 miles northwest of Dixcove and about 1¼ miles from the village of Asani (4° 51' N., 1° 58' W.) The mine is known as the Yakau and as the Yakau-Humakrom-Asani Manganese Concession. No mining has been done since March 1946. From the beginning of operations in 1941, an estimated 9,000 tons of metallurgical ore was produced as well as small quantities of chemical ore. No accurate figures are available on the quantity of earth excavated or the tonnage of ore treated. However, over half of the total production came from an open cut on the south slope of Himakrom, where the ores lies in a 4-foot bed about 26 feet below the surface.

The ore is removed by hand from open pits, the overburden being picked loose and shoveled into cars, to be hauled to the dump. The boulders and chunks of ore are broken by a hand hammer into pieces of 3-inch maximum dimension, during which operation the ore is selected. The selected ore is then washed in one of the three washing plants; the end product is lump ore, chiefly metallurgical grade, containing 48 percent manganese. No other minerals are recovered. The ore is bagged (134 pounds per bag) and trucked to Takoradi for shipment. (Vice Consul Robert B. Houston, Jr., Accra.)

II. INDUSTRIAL MINERALS

GEMS—EMERALDS

Colombia.—On June 17, 1947, the Colombian Government promulgated an executive decree (No. 1986) regulating the mining, cutting, sale, and export of unmounted emeralds. Since 1938, the Government-owned Muzo mines have not been exploited. However, it is understood that the Banco de la Republica, which operates the mines for the Government, contemplates resumption of exploitation toward the end of 1947. Therefore, in preparation for this eventuality, the new decree has been issued in an effort to suppress the black market in emeralds that has been flourishing in Colombia in recent years.

According to Article 202 of the Colombian constitution, all subsoil rights to minerals and precious stones belong to the Government unless title to the land involved dates back prior to April 15, 1886. The leading producing mines in Colombia have been the Muze and Cocuez mines, operated by the Government, and the Chiver mines, which were rediscovered and exploited by a private syndicate. However, recently none have been exploited. Officials of the Banco de la Republica claim that the Chiver mines were left unguarded, and that trespassers came upon stones uncovered by the action

of the elements. It is these stones, pilfered from the Chiver mines, that are reported to be finding their way into the black market. The Banco de la Republica expects to open outlets throughout the country where completely documented stones with values determined by experts will be offered for sale.

Under the terms of the decree that became effective on August 1, 1947, all persons dealing in emeralds must report their operations to the Banco de la Republica and be registered there not later than September 30, 1947. All stocks of unmounted emeralds will have to be reported to the Banco, which plans to have inspectors regularly check on the inventories and sales of registered dealers. All emeralds offered for sale will require a certification as to origin issued by the Banco de la Republica. Fines up to 10,000 pesos will be levied on anyone found dealing in contraband emeralds.

Exportation of emeralds also will be controlled closely. The exporter will be required to have a certificate of origin from the Banco de la Republica, and an appraisal report of the Ministry of Mines to obtain an export license.

Admittedly, the decree will have little effect at first, as the Banca will have to accept at face value the claims of anyone reporting stones for documentation, in the absence of proof, one way or the other, as to the origin of the stones. However, it is hoped that in the future, the origin of all emeralds offered for sale or export will be clear. The decree envisages the complete documentation of all emeralds from the moment of mining through all further transactions. Any stones for which the necessary certification is lacking will be presumed to be contraband, and anyone selling emeralds who is not registered with the Banco de la Republica will be presumed to be a dealer in contraband.

Jewelers and dealers believe that the terms of the decree will be difficult to enforce. Only highly skilled experts would be able to differentiate one emerald from another. They doubt that the Government inspectors will be able to check effectively a jeweler's inventory against previous reports. They also point out that an unscrupulous cutter can claim a greater percentage of waste in the cutting operation than was actually experienced, and thus serve as a source for black-market stones. The possibility always exists that employees at the mines will make off with stones.

(Third Secretary of Embassy J. A. Silberstein, Bogota.)

PYROPHYLLITE

Pyrophyllite is a hydrous silicate of aluminum. It is a soft mineral (H=1-2) and is commonly found in radiated lamellar or somewhat fibrous masses, yellowish-white to brownish-white in color. Beautiful specimens have been found in many parts of the world—a locality for unusually fine specimens is the old abandoned Brewer gold mine, Chesterfield County, S. C., where it has been found in large brownish radiated crystalline masses. Very fine radiating, fibrous whitish masses occur at Staley, Randolph County, N. C. A nice greenish variety is found at Zermat, Switzerland.

From the Deep River district of North Carolina comes almost all of the pyrophyllite produced commercialy. It is a compact variety, resembling slaty soapstone, and greenish to yellowish-white in color. This type is used for the same purposes as talc especially in the manufacture of crayons and tailors' chalk.

Pyrophyllite was first found (over 100 years ago) in the Ural Mountains of Siberia (between Beresov and Pyschminsk) as fibrous radiating light green masses in quartz veins. It received its name from two Greek words—*fire* and *leaf*—because when heated under the blowpipe it exfoliates into large white leaves.

Just as we were going to press, C. A. Thomas of Royersford, Penn., sent us a clipping from his local paper (*Twin Boro Weekly Advertiser,* Jan. 8, 1948) which states that pyrophyllite has recently been found in a small abandoned quarry near the hamlet of Gargol, Adams County, Penn. The mineral, however, has been found before in Pennsylvania but at other localities.

CLUB AND SOCIETY NOTES

ATTENTION SECRETARIES—If you want your reports to appear in the March issue, they must reach us by February 20th—the Editor.

Mineralogical Society of Springfield, Vt.

Twenty-five members and guests of the Springfield Mineral Society were present at the Universalist church on Wednesday night, November 19, 1947, for their regular meeting.

Reverend Corbett, a member of the local club and also treasurer of the New Hampshire Mineral Society, sent in an interesting account of a recent trip to South Baldface Mountain in New Hampshire where topaz is found.

Mr. Nies of Bellows Falls gave a report on a field trip he took to South Newfane where deweylite was found. This is believed to be a new mineral for Vermont. The water in the brook being low, Mr. Nies and his party were able to explore more territory near the water's edge than previously done and several good specimens of onyx, chrysoprase, drusy quartz, serpentine and deweylite were obtained.

"Stan" Goding gave an account of a recent trip to the Chester, Vt., talc quarry where he found good gemmy black tourmaline. He displayed several pieces.

A favorite report was given by Wallace Hilliard on the club's mineral exhibit shown recently in Maxham's store window in Windsor, Vt. This exhibit, the same as shown at Rutland fair, attracted a great deal of attention of Windsor residents and should stimulate mineral club activity in that area.

Showing specimens of rough topaz and cut stones brought in by members and also loaned by Wilson's Jewelry store, H. L. Chandler of the High school faculty gave a talk on "Topaz" the birthstone for November. Modes of occurrence, localities, physical and chemical properties, associate mineral lore and varieties of topaz were included in the lecture. Mrs. Nelson Longe also contributed some interesting articles and pictures on the subject.

The club voted to present as lectures during each of the next 11 meetings, the "Birthstone of the Month." December's talk and exhibit will be on Turquoise and Lapis Lazuli.

A nominating committee was appointed by President Vic Johnson consisting of Chairman, Ray Beardslee, Frank Quimby and Wallace Hilliard to present a slate of officers to be voted on at the January meeting.

Plans were made for a Christmas party to procede an oyster stew supper for club members and guests. At the Christmas party last year each club member wrapped and exchanged a mineral specimen with another member. The plans are similar this year since the project was popular.

The meeting adjourned about 11 p.m., followed by a luncheon of sandwiches, hot chocolate and cake.

Queens Mineral Society
(Richmond Hill, New York)

Mrs. Segeler reported that she had been advised a course in Gem Identification, of eight weeks duration, was to start early in April at Brooklyn College.

Mr. Fredericks announced that progress was being made by the committee, in the society's sponsored program, to compile detailed data relative to collecting in an area of approximately 100 miles with New York City as the central point. It is intended to gather complete, detailed information on localities in which it is possible to collect mineral specimens at this time, as well as the varieties available, whether available in abundance or only occssionaly found. Detailed information on how to reach the listed localities via car, bus or train, will accompany other pertinent facts concerning each locality.

Mr. Segeler, our president, as usual had several interesting and timely subjects to call to our attention. Among the subjects discussed was the proposal to utilize low grade iron ore by means of a low cost concentration process recently developed. The process was described in considerable detail and we were then introduced to Mr. C. Peary who was our featured guest speaker for the evening.

Mr. Peary projected a collection of outstanding colored photos, taken in the course of his many trips below the earth's surface in many parts of our country. Mr. Peary highlighted the showing of his pictures with remarks of his underground experiences and he also described animal and plant life that is to be found. We were also informed that seeds found in the caves produced plant life when exposed to artificial light despite the fact that they may have lain in the cave for hundreds of years. The caves described included the famous Carlsbad, Luray and Howe Caverns, the Devils Hole and other caves not as well known. Mr. Peary concluded a most entertaining program by describing in detail, the various equipment used in cave exploration.

W. L. Stadler
Secretary

Texas Mineral Society
Dallas, Texas

At the December, 1947, meeting of the Texas Mineral Society, Geo. A. Ripley showed color slides of his 3½ month tour of the Northwestern States, Yellowstone Park and Glacier National Park. There was a Christmas tree loaded with gifts for each person present.

Ralph D. Churchill
Secretary

Los Angeles Mineralogical Society

"ROMANCE OF GOLD MINING". That was the topic selected by the speaker, Past President, Wm. Harriman, Thursday evening, December 18, 1947, at the regular meeting of the Los Angeles Mineralogical Society at the Premiere Cafeteria, 3716 Wilshire Boulevard, Los Angeles, Calif.

The Speaker, well qualified, had a wealth of legends of early Gold Mining, not only in California, but throughout the West, at the tip of his tongue, and kept his listeners on the edge of their chairs for nearly two hours. The attendance was small, for such a large organization, only about fifty of us, whereas there should have been a couple of hundred, but those present were alert, congenial, and a warmth of spirit was prevalent fully in keeping with the Yule Season. It was our Christmas meeting and presents were exchanged—a mineral specimens for each. One specimen donated by Howard Paget, a fluorite cluster, was won by one lady member who stated she would not take twenty dollars for it. Howard also exhibited a gold specimen, free gold in (get this—limestone), and it was stated by some that the sample would assay in the neighborhood of Forty-five thousand dollars a ton.

Mr. Harriman reminded us that January 24th, 1948, will mark the centennial of Marshall's discovery of gold at Sutter's Mill in California, which caused the Gold Rush of 1849, and later the influx of desperadoes like Joquin Murietta, and Three fingered Jack who sought to profit by robbing the lucky miners. The early miner's life in the Wild West was no bed of roses, as is evidenced by so many tales of hardships and privations suffered by those staunch pioneers.

He told us of Jedadiah Smith, Trapper, Gold Miner and Explorer, who fought the Indians many times, and how he and a small party once surrounded in a canyon, turned adversity into good fortune by finding gold and washing $25,000 worth of the precious metal out of the sands of its creek while the Indians kept them bottled up. Smith, intending later to return and develop this project, was killed on the head waters of the Cimarron River in Texas, by warlike Comanche Indians, at the age of 38 years. They died young in those days.

Our eagerness to get out and pan the yellow dust was increased by tales of the Cowboy returning with his herd near Mojave, cutting across a low butte, discovered a hole dug by previous prospectors, and taking a few specimens in his saddle bag, gave one to an Assayer, Carlisle by name. The Assayor placed it in a paper sack and wrote the name of the Cowboy on it, then lost track of it on his crowded shelves for about twenty years, but finally assayed it, just for the fun of it, and found it to contain $200 dollars per ton, but the boy could not then be found.

John A. Quinn
Publicity Chairman

Mineralogical Society of Southern Nevada

A Christmas banquet, held December 16th, at Lake Mead Lodge, crowned a most successful year for the Mineralogical Society of Southern Nevada.

After dinner a quiz program, patterned after "Information Please", was conducted and proved to be very interesting as well as informative. Questions pertaining to mineralogy and geology prepared by the members were hurled at the panel of "Experts", including Mr. C. P. Christiansen, Mr. H. Fuller and Mr. J. Wood, Mr. M. G. Mastin, Chairman of the Program Committee, acted as Master of Ceremonies.

Although the "Experts" responded exceptionally well to the barrage, a few questions "stumped" them with the result that mineral specimens, (not Britannicas) were won by the following: A. T. Nowell, Mrs. R. McNeil, Mr. R. McNeil, John Wells, Mrs. E. L. Sapp, F. McMillan and D. McMillan. Members and friends then pulled surprises from a "grab bag", of gifts, comprised of everything from turquoise to that etra eye of the mineralogist, a magnifying glass.

The evening was concluded by an announcement by D. McMillan, Vice-President, that the Society is now an incorporated organization, with the title of "Mineralogical Society of Southern Nevada, Incorporated", mailing address, P.O. Box 23, Boulder City, Nevada. This progress means the attainment of the goal for which the Society has been striving, namely: absolving from a "Sunday picnic group looking for pretty rock" to an organized educational group whose primary interest is the advancement of the earth sciences.

Florence McMillan
Secretary

San Diego Lapidary Society

The recently organized San Diego Lapidary Society is off to a good start with 72 members who are interested in collecting, cutting, polishing and/or mounting stones.

The officers of the Society are Mr. Marion R. Shunk, President; Mr. Frank Dennis, Treasurer; and Mr. George W. Converse, Secretary. Regular meetings are held on the second and fourth Tuesdays of the month in the State Building, Balboa Park, San Diego, Calif., at 7:30 P.M.

The membership is composed of beginners as well as experienced members, many of whom are taking a course in jewelry making and lapidary work at night school.

The Society had its first field trip in November to the Baldwin Tourmaline Mine near Ramona, San Diego County, Calif., with a fine turn-out of enthusiastic pickers, diggers, and sifters, who had some good specimens to show for their efforts.

Miss Helen Converse
Publicity Chairman

New York Mineralogical Club

American Museum of Natural History, New York, Wednesday, November 19, 1947.

Mr. Jay T. Fox spoke on "Photographing Minerals in Color". It was a non-technical and very informative talk which dealt briefly with the introduction and development of color film and how it differs from black and white film. The speaker stressed the importance of exposure and the quality of light in order to get true color reproduction. He then showed a series of colored slides of minerals, both cabinet specimens and mciromounts and also several gems. In addition to these slides, an excellent motion picture, in color, of the gems of the Morgan collection, was also shown.

Several members spoke on their recent collecting experiences.

Mr. Taylor took a trip to Canada where he collected some very nice apatite in pink calcite, about 15 miles north of Hull. He also traveled in Georgia, Tennessee, North Carolina and Virginia where he visited several mineral localities.

Dr. Hawkins presented a specimen of fuchsite to the collection of New York City Minerals.

Dr. Pough also spent some time in North and South Carolina and Virginia and in addion to the well known localities visited a tungsten mine at Townsville on the border between North Carolina and Virginia, and collected very fine huebnerite and some scheelite. For those interested in fossils he observed that the road to Myrtle Beach, South Carolina, is literally paved with fossils.

Triplite, in good sharp crystals as large as 2 inches by 1 inch, was reported from Chandler Mills, New Hampshire, and the first American occurrence of Brazilianite at the Palermo Quarry, New Hampshire, were also reported.

The meeting was adjourned at 9:55 p.m.

Purfield Kent, Secretary

Newark Mineralogical Society

At the 252nd Meeting of the Newark Mineralogical Society, held on December 7th, 1947, at the Newark Museum, Newark, N. J., Mr. Edwin Skidmore of Mountainside, N. J., and a member of the Society, gave a very interesting talk on his vacation trip to conventions in the western states. He accompanied his talk with the most beautiful Kodachrome slides of scenes of his home, each state to and from the west; of birds, flowers, mines, mountains and minerals.

Mr. Skidmore probably scored another first to his many others, by leaving from a near by air-port one fine summer morning and flying to Canada, visiting a mineral location, collecting and being home for supper. He showed a much coveted picture of the George Washington bridge he took from the plane.

The meeting was concluded with a display and talk on fluorescent and phosphorescent minerals by Mr. Skidmore.

Herman E. Grote

North Country Mineralogical Club

Mr. Arthur Sandiford, of the Champlain College faculty, was the speaker at the November meeting of the North Country Mineralogical Club, held in the lecture room of the Plattsburgh Public Library, Plattsburgh, N. Y., on Friday evening, November 14th. His talk on blowpipe analysis was accompanied by a demonstration of the use of the blowpipe in determinative mineralogy. He showed the two most important methods used for this purpose: the heating of small fragments of the mineral being tested on charcoal blocks and on plaster (gypsum) molds, explaining the means of making both the latter. When heated on the charcoal blocks, the minerals formed white sublimates in certain well-defined shapes and areas. With gypsum, other minerals reacted to form colored sublimates, some of brilliant hues. The speaker also explained and demonstrated the use of the blowpipe to form "beads" of certain minerals within a loop of platinum wire, the color indicating which elements are present. These blowpipe tests are extensively used commercially.

The December meeting was held on Thursday evening, December 11th, featuring a Christmas party for the members. An attractively lighted and decorated Christmas tree was arranged by Miss Helen Hale. Refreshments were served and presents exchanged. Plans were discussed for the January meeting, which will be our first anniversary. Dr. Everett Manwell and Mr. Arthur Sandiford will be in charge of the program.

Gertrude E. Cone

Georgia Mineral Society

On Monday evening, December 1, 1947, the Georgia Mineral Society met in the Engineering Building at the Georgia School of Technology, Atlanta, Ga.

Members voted to establish a section on Gemology. All members in good standing are eligible to become members of this new section on payment of a small yearly fee. The first meeting is scheduled for the early part of January.

The main event of the evening was a lecture by Prof. Allen of the Department of Geology of Emory University. His subject was "A Field Trip to the Southwestern United States" and was illustrated by colored slides. This trip was sponsored by the Geology Department of Emory University and selected and graduate students made the trip in the Geology Department bus to points in the oSuthwest, studying and mapping various geologic points of interest.

After the meeting adjourned everyone gathered around Dr. Furcron to examine an emerald '?'. It is a recent find east of Atlanta, the location being top secret for the present.

S. C. Knox
Corresponding Secretary

Los Angeles Lapidary Society

The Los Angeles Lapidary Society held its annual Christmas meeting on December 1, 1947 at the Police Academy, 1880 N. Boylston Avenue. After a good dinner the Christmas Box was opened and each member and guest was presented with a gift that the members of the Society had contributed. Among the presents were many lovely cabochons, sparkling faceted stones, beautiful pieces of jewelry and several of the new type mineral-lites.

The L. A. L. S. now has a committee comprised of past presidents to assist groups of lapidary minded people in organizing new lapidary and gem societies. Please write our secretary, Mrs. Jean Bennett, P.O. Box 8184 Terminal Annex, Los Angeles 54, Calif., or call her on Atlantic 2-1423 (Alhambra) if interested.

THE FACETEERS:

As usual there was a fine display of beautiful, well cut stones, Mr. Jim Underwood displayed a fine scale that he had made which not only weighs stones but will also determine specific gravity.

Mr. Carl Wood demonstrated a new light for orienting stones.

Mr. Ted Bennett gave an interesting talk on corundum stones. This talk brought about a general discussion of methods of cutting and polishing both synthetic and real ruby and sapphire. It also brought out the difficulties encountered in such work.

Willella Gunderson
Publicity Chm.

Pacific Mineral Society, Inc.
(Los Angeles, California)

The December meeting of the Pacific Mineral Society, Inc., was a jolly Christmas party at the Chancellor Hotel in Los Angeles, on December 12th. After a very good turkey dinner, games were played, prizes being minerals, of course. "Santa Claus" in the person of James Underwood, Vice-President and Program Chairman, produced a Christmas tree loaded with gifts wrapped in colored paper—one or more for each member. Jim was a very generous Santa Claus and a vote of thanks went to him, as well as to his wife and daughter, who helped decorate the tree. There was also a grab bag with gaily wrapped minerals, brought by the members.

Mrs. O. C. Smith

Tucson Gem and Mineral Club
(Tucson, Arizona)

A large crowd attended the birthday meeting of the Tucson Gem and Mineral Club, December 2, 1947. Plans for the following year include an exhibit, sponsoring a junior Rock club, a monthly Rock Hound News, and field trips. New officers elected are J. R. Watwood, President, S. L. Wolfson, Vice-President, and Mrs. A. H. Murchison, Secretary. The club meets regularly every first and third Tuesday and visitors are always welcome.

PETRIFIED FOREST IN KAOKOBELD

(*Continued from page 19*)

have more than a score of creatures represented in the collection.

The four ages of life are found in soft cave fills and depositions of hard, white lime.

The story being read in the rocks of Taungs will do much to shed light on the ancient life and beginnings of culture in South Africa.

Rocks and Minerals is grateful to Ernest M. Skea, Pilgrims Rest, Transvaal, South Africa, for the above article which he clipped from *The Star*, a Johannesburg daily newspaper, and air mailed to us. We are very sure the article will prove of considerable interest to our readers and for this reason it is reprinted. —The Editor.

Wavellite First Found in England

Wavellite is a hydrous phosphate of aluminum. Its common color is white but it is also found in yellow, gray, blue, brown, and black colors. It is usually found in acicular radiating crystals. Very fine specimen of green radiated specimens, perhaps the finest known as they are often used to illustrate text books on mineralogy, come from Magnet Cove, Ark.

Wavellite is a secondary mineral formed by the action of circulating water upon rocks rich in aluminum, hence it is found on the surfaces or in cavities, cracks or crevices of those rocks. It resembles pyrophyllite but the latter is scratched easily by the finger nail whereas wavellite has a hardness of 3½ to 4.

The mineral was first found (over 140 years ago) by Dr. William Wavel, in crevices in slate near Barnstaple, Devonshire, in southwestern England, where it is still abundant. In 1805, Dr. William Babington, the English mineralogist, named the mineral, wavellite, after its discover.

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